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THE UNITED STATES BATTLESHIP LOUISIANA.*

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BUILT BY THE NEWPORT NEWS SHIP BUILDING & DRY DOCK CO.

The Louisiana is one of the battleships authorized by act of congress approved July 1, 1902; the other, the sister ship, being the Connecticut, built at the navy yard, Brooklyn, N. Y. The under-water body of each of these two vessels was designed in accordance with the results of careful experiments made with models in the model tanks at the Washington navy yard, and these ships are the first large vessels of war of the United States navy in the design of which this method was followed. The ease with which the Louisiana met the contract requirements for speed, the performance of the ship, in exceeding by 0.823 knot her contract speed, the close agreement between the horsepower and assumed speeds, as found by the tank trials, and the horsepower and speed on actual trial of the ship, all fully justify the building of the tank, if such justification were ever needed. To judge from the expressions of approval and the praise and enthusiasm of those who were present at the trial, the Louisiana is the best battleship that has been turned out by the United States.

The total contract cost of the vessel, excluding armament, is $3,990,000, of which $1,000,000 is for propelling machinery and other items under steam engineering.

The guaranteed speed is 18 knots per hour, to be maintained during four consecutive hours, under forced draft, the air pressure not to exceed 2 in. of water; the vessel to be on a mean draught of 24 ft. 6 in., the corresponding displacement being 16,000 tons. The contract imposes penalties for failure to come up to speed as follows: A deduction at the rate of $50,000 for one-quarter knot below 18; at the rate of $100,000 for one-quarter knot below 17¾, and, if the speed falls below 17½, the government to have the right to reject the vessel.

The actual performance of the ship on her official four-hour run, on December 13, 1905, at Rockland, Me., was 18.823 knots, at a mean draught of 24 ft. 7¼ in., corresponding to a displacement of 16,055 tons, with a mean air pressure of 1.98 in.

The hull is made of basic, open-hearth steel, with frames spaced four feet apart, except under the engine compartment, where the frames are space two feet apart.

The inner bottom extends from frame 12 to frame 98. The double-bottom compartments between frames 58½ and 67½ are arranged for use as reserve feed tanks. A cofferdam, 30 in. in width, extends the entire length of the ship about the protective deck, being carried to a height of three feet above the protective deck, and is packed with corn-pith cellulose in those parts forward and abaft the midship armor. All unexposed decks throughout the ship are covered with linoleum, except in the magazines, in certain store rooms, wash rooms, etc., where a wood covering placed on tiling is used.

PROTECTIVE DECK.

This deck extends the full length of the ship, and is three inches thick on the slopes, and 1½ in. on the flat. The cofferdam previously mentioned extends its entire length, and the spaces between the slopes and berth deck are used for stores, except from frame 40½ to frame 72, where the berth-deck coal bunkers extend to this deck.

ARMOR.

The side belt is a complete water-line belt, nine feet three inches wide amidships, for the length of the lower casemate; forward, this width is reduced to eight feet and aft to 71 in. from frames 35 to 83, or 192 ft. in wake of machinery spaces, the thickness is 11 in., tapering from 11 in. at a point five feet three inches below top edge to nine inches at lower edge, which is five feet below L. W. L.

Forward and aft of these points the thickness is nine inches at top, tapering to seven inches at bottom, then reduced to seven inches at top and five inches at bottom, then to five inches constant thickness, then to four inches constant thickness.

Covering the middle length of the ship there is a lower casemate belt of six-inch armor extending from the top of the heavy side belt to the lower edge of seven-inch gun ports, two feet eight inches above the gun deck. Above this, and extending to the height of the main deck, is a seven-inch belt which is bent in to form wing plates at the seven-inch gun ports.

Between the gun deck and the protective deck, at frames 24 and 94, there are athwartship casemate bulkheads, six inches thick; these are outside of the 12-in. barbette. Between the gun and main decks are similar six-inch bulkheads at frames 28 and 86, connecting to the 12-in. barbettes. These athwartship bulkheads connect the ends of the casemate armor, forming a complete central casemate.

Between the gun deck and main deck, athwartship, splinter bulkheads of nickel-steel are provided for protection of seven-inch battery, each gun

*Condensed from the *Journal of the Society of Naval Engineers.*

being thus in an isolated protected compartment. These are of the 60-lb. plates, and located at frames 36, 50, 57, 64 and 78, those in wake of boiler uptakes not being continuous, those at frames 36 and 78 being continuous. A continuous fore-and-aft splinter bulkhead of 80-lb. nickel-steel plate is fitted between 12-in. barbettes. Armored hinged doors are fitted in splinter bulkheads where necessary to provide access.

The 12-in. barbettes are 10 in. in thickness at front and 7½-in. thickness at back, from the top to the gun deck, and six inches between gun deck and protective deck. The 12-in. turrets are 12 in. thick on slope, remainder being eight inches, top plate 2½ in.

The eight-inch barbettes are six inches thick at front and four inches thick at back, with tubes from main to gun decks of 3¾ in. and from gun to protective deck of three inches thick.

The eight-inch turrets are 6½ in. thick on slope, remainder six inches; top plates two inches thick.

The conning-tower is nine inches thick, and fitted with a swing door. The armored tube for communication is six inches thick. The signal tower aft is six inches thick.

BATTERY.

The 12-in. guns are mounted in pairs in two elliptical electrically-controlled balanced turrets, each having an arc of fire of 270 degrees.

The eight-inch guns are mounted in pairs on four elliptical turrets, located two on each side and about equally spaced between the two 12-in. turrets. Each pair have an arc of fire of 145 degrees, the forward pairs from 90 degrees forward to 55 degrees, abaft beam; after pairs, vice versa.

The seven-inch guns, twelve in number, are mounted singly on pedestal mounts with shields, in the central armored casements on gun deck, each having an arc of fire of 110 degrees.

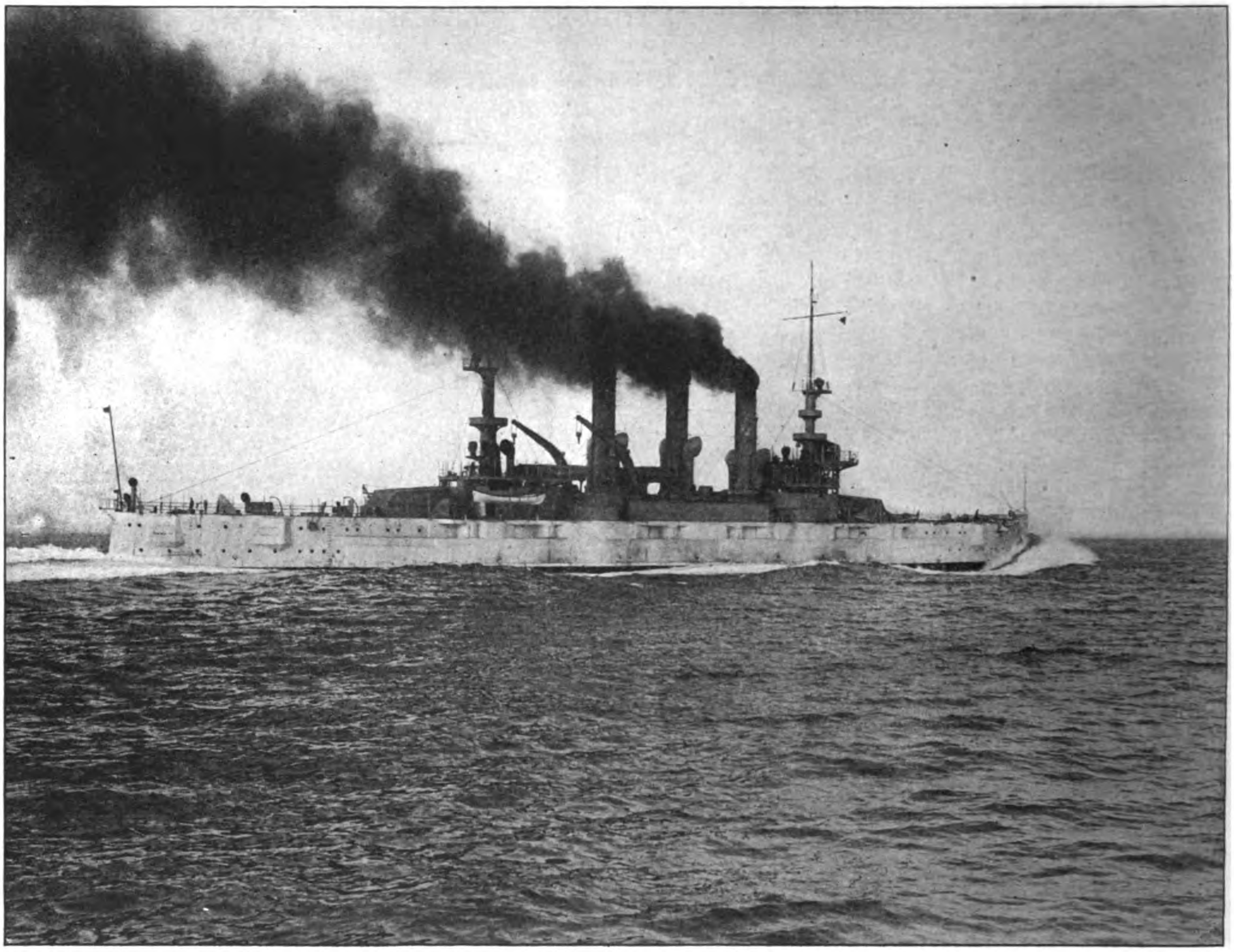
The secondary battery consists of twenty three-inch R. F., ten three-pr. semi-automatic Hotchkiss, two one-pr. H. R. F. automatic, two 30-calibre Gatling machine guns. Four 21-in. submerged torpedo tubes are provided for, two forward and two aft. There are two Barr and Stroud range finders, one in each upper military top.

AMMUNITION SUPPLY.

Ammunition hoists are provided in number and speed designed to obtain as far as practicable a full supply of ammunition necessary for all guns firing at maximum speeds. In addition to the usual hoists in eight-inch and 12-in. turrets, there are twelve seven-inch hoists capable of handling either shell or charges, and fourteen combined three-inch three-pr., and one-pr. hoists. All hoists not within the armored citadel are protected with 80-lb. nickel-steel plates. In order to supply ammunition to the hoists located along the ammunition passages on each side of lower platform deck, four continuous-motion ammunition conveyors, each about 80 ft. in length, are provided. These convey the shell and charges from the magazines located forward and abaft the machinery spaces on that deck.

COALING ARRANGEMENTS.

The coal capacity is 2,404 tons, of



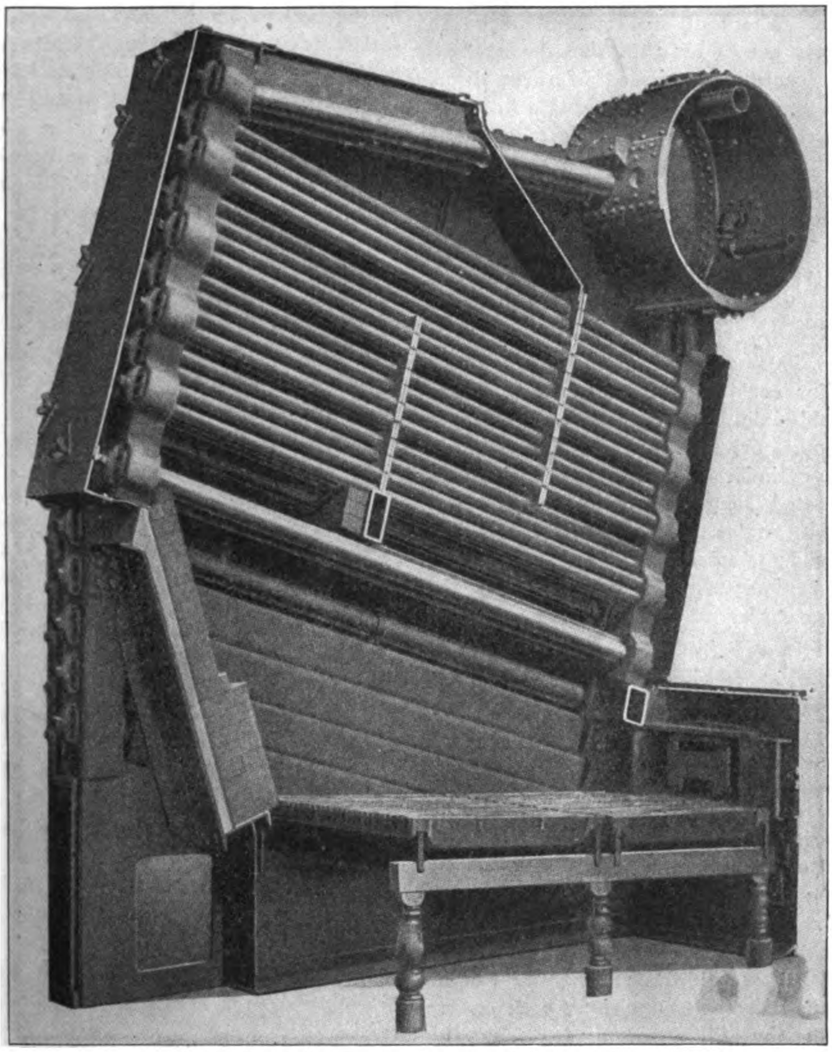
THE BATTLESHIP LOUISIANA ON HER SPEED TRIAL.

which 718 tons is carried above the protective deck, and 364 tons in the transverse bunkers at the ends of the boiler space.

There are two military masts. The fore mast is at frame 36, the main mast at frame 76. Each mast has an upper and a lower military top and a signal yard. The main mast has a lower searchlight platform, below the lower top. On the fore mast, just above the signal yard, is a look-out platform, fitted with guard rails and in communication with the bridge. The main mast is fitted with a small monkey gaff, and the wireless telegraph connections will be fitted on this mast.

POWER WATERTIGHT DOORS.

There are forty-two doors and five armored hatches, which are operated by electrical power. They are of the long arm system, similar to those installed on previous ships. They are so designed as to be operated on the spot by power or hand gear for either side of the bulkhead or deck. They can also be operated simultaneously by power from the emergency-control station located on forward bridge. Electrically-operated solenoid whistles are provided as a warning when doors are to be so closed. During any period of emergency operation, any individual door or hatch can be operated by power or hand, and after such operation during the period of emergency operation the closing repeats itself automatically.



SECTION OF BABCOCK & WILCOX BOILER.

STEERING ENGINE.

The steering gear is operated by a Williamson Bros. steam-steering engine, operated through a right-and-left-hand screw by a traveler with side rods to the crosshead. The contract requires that the rudder can be put from hard over to hard over, 70 degrees in all, in 20 seconds, with ship at full speed. The operating steam pressure is 150 lbs. The valves are worked by wire-rope transmission from flying bridge, bridge, conning tower and communication room. Valves may also be operated by a handwheel at engine. There is a hand-steering wheel in steering-engine room, and an arrangement for relieving tackles direct to crosshead.

ELECTRIC PLANT.

The electric plant is of a greater capacity than any that has been installed, so far, in any other vessel built for the United States navy. There are eight 100-kilowatt generating sets, of 125 volts pressure at the terminals; the generators were supplied by the General Electric Co., and are of the direct-current, compound-wound, multipolar type. The wiring is on the two-wire system.

The turrets are controlled on the Ward-Leonard system. The current for driving the turret-training motors and the gun-elevating motors, both 12-in. and eight-inch is furnished by motor generators in each turret, which, in turn, are driven by current from the main generators. With this arrangement one main generator may be used to furnish current for both turret power and lighting at the same time, without having the flickering of lights due to variation in the load when working the turrets.

LIGHTING OUTPUT.

The output for lighting supplies 1,100 16-c. p. incandescent lamps; an additional 100 lamps will probably be provided; also ten three-ampere arc lights; two 60-inch searchlights (of about 42,000 c. p. each), and four 30-in. searchlights (of about 20,000 c. p. each); two night signaling sets, two truck lights; two diving lanterns with eight 150-c. p. lamps.

INTERIOR COMMUNICATION.

A complete central-station system of telephones is installed. In addition, private lines are run for executive officer, navigator, chief engineer, surgeon and electrical gunner. There are twenty-five separate lines from the central station and seven private lines. In addition, there are eighty-seven lines of voice pipes.

MAIN ENGINES.

There are two four-cylinder triple-expansion engines of the vertical, inverted-cylinder, direct-acting type, placed abreast each other in separate watertight compartments, which communicate through a watertight door in the center-line bulkhead. The engines are of the contractor's design, built under specifications of the bureau of steam engineering. The engines are right-and-left, turning inwards when going ahead. The engines were designed to develop 16,500 H. P. when making about 120 revolutions (for a speed of 18 knots) per minute. On the standardization trial, the horsepower at 120 revolutions was 16,128. The

cylinder diameters are: H. P. 32½; M. P., 53; both L. P., 61.

The arrangement of the cylinders, beginning forward, is: forward, L. P., H. P., I. P., after L. P. The arrangement of cranks is: the forward L. P. and H. P. cranks are opposite; also the M. P. and the after L. P. cranks, the second pair being at right angles with the first. The engines turn inwards going ahead, and the sequence of the cranks is: H. P., M. P., forward L. P., after L. P. The crank shaft is in two sections.

The engine framing is of the Bailey design, the cylinders of each engine being supported by six pairs of forged-steel columns which are tied together and braced by forged-steel stays. This is an admirable design, very rigid and strong and leaving the moving parts accessible for oiling, cleaning and overhauling. The forward L. P. and H. P. engines are secured together, as are the after L. P. and the M. P. The pairs of cylinders of one engine are secured across to those of the other engine by tie rods through the middle line bulkhead, and by tie rods to the forward and after engine-room bulkheads. The vibration on trial was inappreciable.

The method of securing the crosshead guides is different from that in the usual design, and is as follows: To the top of the engine columns a cast steel strong back, or girder, of I-section is bolted, its axis horizontal; another similar girder is bolted to the columns at their mid-height. On each girder, between each pair of columns are four swelled bosses, through which are drilled bolt holes; through these holes pass the bolts which secure the crosshead guides to the girders. The guides are further supported or hung by short tie rods, between the top of each guide and the bottom of the cylinder.

The engine bed plates are of cast steel, and are made in three sections for each engine, bolted together at flanges. Each section carries two main bearings.

Each main engine has a reversing engine of the usual floating-lever, oil-controlled type. For each main engine there is a turning engine, which is double and is fitted with link motion.

MAIN CONDENSER.

One main condenser is located on the outboard side of each engine room. The shell is made of boiler-plate, the heads of composition and the tube sheets of Muntz metal. The tubes are not tinned, and both tubes and ferrules are made of admiralty metal. The forward head of each condenser is fitted with a "butterfly" valve, so that the water from the circulating pumps can be passed directly overboard without going through the condenser tubes. Zinc plates are placed inside on the manhole plates of each head. The shell is lagged with cowhair felt and covered with galvanized sheet steel.

MAIN AIR PUMPS.

The main air pumps are of the Blake, twin, vertical-beam type, single-acting, with two steam and two water cylinders. The foot, bucket and discharge valves are of uniform size throughout, and each is composed of three discs, the upper disc having a single hole for valve stud or spindle, while each of the lower ones has in addition eight ¼-in. holes drilled near its periphery in such a manner that the disc above will cover the holes in the disc below when the valve as a whole is seated, but will allow the escape of water between the discs.

MAIN CIRCULATING PUMPS.

For each main engine, there is one double-inlet, centrifugal circulating pump, driven by an independent two-cylinder, compound, vertical, inverted engine, with cranks at right angles. The pumps are designed to deliver each 12,000 gallons of water per minute from the bilge at a speed not exceeding 265 revolutions per minute. The pumps are located outboard, just forward of the main condenser.

Each pump is fitted to draw from the sea, the main drain and the engine-room bilge, and to discharge through the condenser overboard or directly overboard, through valves in the condenser bonnet (a butterfly valve in the forward bonnet). The three suction valves are interlocked so that the main injection valve, or the bilge-injection and the main-drain valve, only can be opened at the same time, a departure from the old usual arrangement by which no two of these valves could be opened at the same time.

The casing and runner of the pump are made of composition and the shaft of phosphor-bronze.

MAIN FEED PUMPS.

There are four main feed pumps, two in each engine room. They are of the Blake, vertical, simplex, double-acting type, with outside center-packed plungers, sucking from the pipe connecting the main feed tanks and discharging through a grease extractor into the main feed discharge, directly or through the feed-water heaters.

BOILERS.

There are twelve Babcock & Wilcox boilers, placed in six watertight compartments, with the axis of each boiler drum athwartships.

The arrangement of the boilers is most satisfactory. There is ample room at the sides and the back of each boiler for access to the cleaning and dusting doors and for cleaning and overhauling, taking out tubes, etc.; and there is a great deal of room over the boilers.

The boilers are each twenty-five sections in width, or "25-wide," the distance from center to center of sections being seven inches. The performance of the boilers on the trial was entirely satisfactory in every way. There was a slight leaking in the nipples in the front cross boxes or mud drums; this was due to the rigid manner in which the mud drums were held in between the corner boxes and the middle box, which permitted no expansion of the mud drum longitudinally. This has been remedied by cutting out one of the nipples from the inner end of one of the mud drums, leaving this drum free to expand in the direction of its length and leaving the middle box free to spring slightly to one side with the expansion of the other mud drum.

GENERAL WORKSHOP.

The workshop is the most satisfactory in equipment that the writer has ever seen aboard a naval vessel. All the power tools are electrically driven, each independently of the others. The shop is very conveniently and comfortably located in the central part of the engine room hatch. The following is the equipment of the shop, viz.:—

One 36-in. back-geared engine lathe, 12 ft. between centers.

One 14-in. back-geared engine lathe, five feet between centers. (Both of these tools were made by the Lodge & Shipley Machine Tool Co., of Cincinnati.)

One 16-in. crank-shaper, with eight speeds, made by the Cincinnati Shaper Co.

One universal milling machine, with a range of 22 in. by 6.5 in. by 18 in., made by the Cincinnati Milling Machine Co.

One 22.5-in. vertical drill, back geared.

One 12-in. sensitive drill, drilling holes up to ⅜ in. (Both drilling machines were made by James Clark Jr., & Co., of Louisville.)

One emery-grinder, with two wheels, one for plane grinding, one for tools; wheels two inches by 12 in.—made by James Clark Jr., & Co., of Louisville.

Two vise benches (one vise on each).

Each of these tools has its own electric motor for driving it, and it is hoped that the noisy, dirty and troublesome shop engine has forever disappeared.

There is a compressed-air connection in the shop for pneumatic tools.

RECENT BOILER EXPLOSION REPORTS.

EXPLOSION FROM THE BOILER OF THE STEAM DRIFTER KINGFISHER, OF GRANTON (NO. 1,598).

This boiler is of the ordinary cylindrical multitubular marine type. It is about 9 ft. 10 in. in diameter, and about 9 ft. 7 in. long, being fitted with two furnaces about 3 ft. in diameter, connected to a combustion chamber common to them both. The boiler is said to have been removed from the steamship Sir Francis Head, on board of which vessel it had been little used. The year of construction, said to be 1895, could not therefore be verified. The boiler was bought by the present owner and fitted on board the Kingfisher in April, 1900. At that time bolted patches appear to have been already fitted where marked A, B, and C in Fig. 1. There was also a patch 14 in. by 10 in. over the shell seam at the bottom of the boiler, and new furnaces appear to have been fitted. In December, 1903, riveted patches appear to have been fitted at D and E by Messrs. T. and H. Morton & Co., Leith. In April, 1904, the owner had the bolted patch at B replaced by a larger one riveted to the boiler, the owner's engineer and boilermaker doing the work. In April, 1905, the bolted patch at C was replaced by a larger bolted one. These patches had to be enlarged owing to the corrosion of the plate around the old patches.

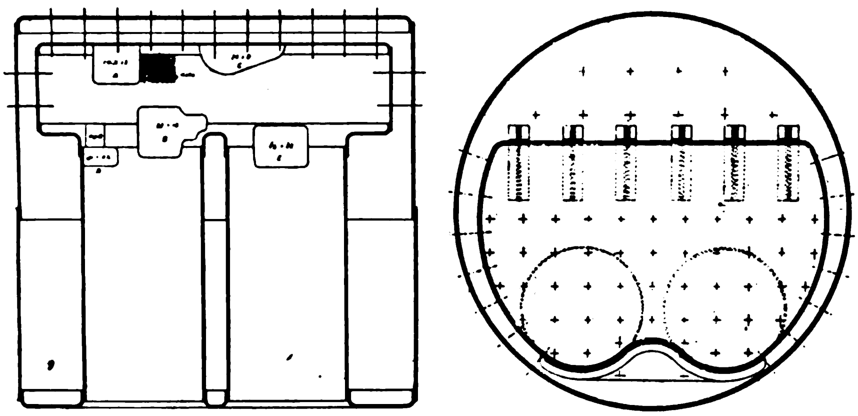


FIG. 1. BOILER OF THE STEAM DRIFTER "KINGFISHER."

The explosion was due to the local wasting of the combustion chamber bottom plate on the fire side until it became so thin that it was unable to withstand the ordinary working pressure. A hole 1½ in. long by 1 in. at the broadest part was formed in the bottom plate of the combustion chamber close to the patch marked A. Through this opening the contents of the boiler escaped rapidly into the stokehold. The pressure in the boiler at the time of the explosion was about 75 lbs. per square inch.

The engineer surveyor-in-chief observes that under different circumstances the explosion might have been attended with serious results, for the vessel was thereby rendered helpless so far as the engines were concerned. The plates of the boiler were very much wasted by corrosion, and that this action has been going on for a considerable time is evident from the number of patches fitted and the necessity for enlarging them at various times. The examinations of the boiler for some time prior to the explosion can only have been of a most perfunctory nature, and this is not to the credit of those responsible for its safe condition.

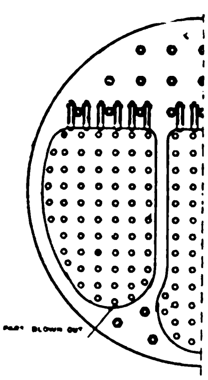


FIG. 2. THE MAIN BOILER OF THE SS. "PEARL." STARBOARD HALF SECTION.

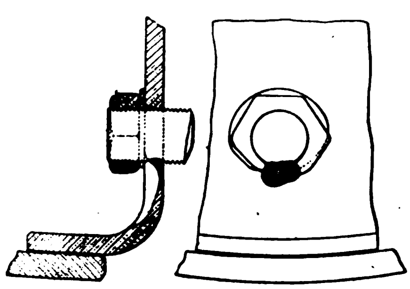


FIG. 3. SHOWING PART BLOWN OUT.

EXPLOSION FROM THE MAIN BOILER OF THE S. S. PEARL (NO. 1,599).

The steamship Pearl is a screw steamer of 691 gross tonnage, and 90 nominal horsepower, employed solely in the coasting trade.

The boiler which formed the subject of this inquiry is of steel, with iron tubes, and is of the ordinary cylindrical multitubular marine type, single-ended, 14 ft. in diameter by 10 ft. 6 in. long, with three plain furnaces, each 3 ft. 6 in. in diameter.

There is a separate combustion chamber to each furnace, the wrapper and back plates of which are 9-16 in. thick, supported by screwed and nutted stays pitched 8¼ in. apart each way. The boiler is fitted with the usual mountings, including two spring-loaded safety valves adjusted to blow off at a pressure of 160 lbs. per square inch.

The engineer surveyor-in-chief states that the explosion in this case was the result of the corrosion of the back plate of a combustion chamber, consequent on leakage around one of the stays, whereby the plate was so reduced in thickness that it could not successfully withstand the ordinary working pressure of the boiler, and a small portion was blown out. Although the part affected was very local, it was plainly visible from the inside of the combustion chamber, and, as the wasting action must have been going on for a considerable time, it is somewhat surprising that the defect was not noticed and remedied before the explosion occurred, for one would have thought that the leakage which doubtless existed would have drawn attention to the condition of the plate. This absence of careful supervision was responsible for the disablement of the vessel, which under less favorable circumstances, might have been serious.

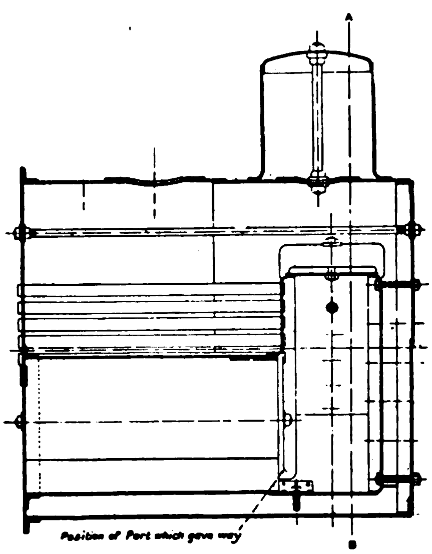


FIG. 4. BOILER OF THE SS. "ENTERPRISE."

EXPLOSION FROM THE MAIN BOILER OF THE S. S. ENTERPRISE (NO. 1,600).

The vessel is engaged in the general coasting trade. A hole, measuring

about 2 in. by 7/8 in. was formed in the saddle plate at the back of the furnace on the port side, through which steam and hot water escaped, the pressure at the time being about 50 lbs. per square inch. The plate had become thin by internal corrosion over an area measuring about 4½ in. by 2 in. until it was no longer able to withstand the working pressure. The boiler was made at Northwich in 1883 for another vessel,

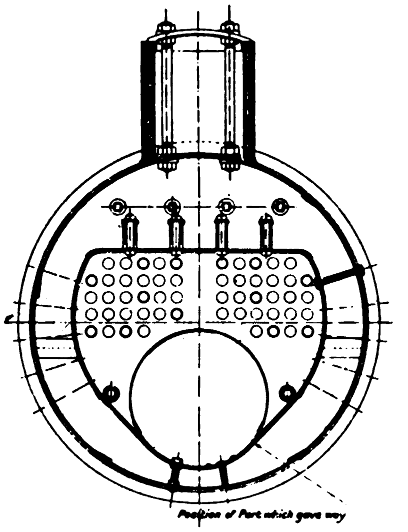


FIG. 5. BOILER OF THE SS. "ENTERPRISE." SECTION ON LINE A—B LOOKING AFT.

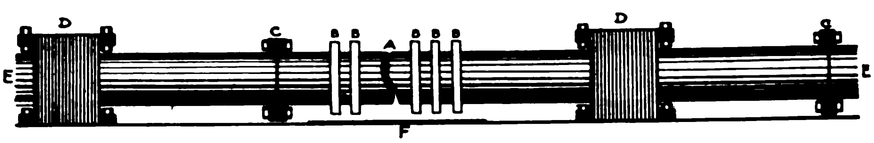
but being too small it remained in the maker's yard at Northwich until September, 1894, when it was bought for the steamship Enterprise.

The engineer surveyor-in-chief states that "the explosion in this case caused the disablement of the boiler, but fortunately, no one was injured. The part that gave way is one of the places that would be examined and tested by those experienced with old boilers; but, in this instance, the corroded condition of the plate appears to have escaped observation entirely. Reference is made in the report to the fitting of a cup patch over a defective or leaky stay. This is a dangerous method to adopt and has frequently been the cause of explosions from boilers in the past. It was thought to be common knowledge that such patches had proved so dangerous that the practice had at last been abandoned altogether, and those using this boiler would, I think, do well to adopt another means of repairing such parts in future."

The Harlan & Hollingsworth Corporation, Wilmington, Del., is constructing a wrecker for the Merritt & Chapman Wrecking Co. of New York. The designer of this vessel, which is to be of steel, is Mr. Horace See. The wrecker will be 200 ft. long, 30 ft. beam and 20 ft. deep.

BREAK OF A PROPELLER SHAFT.

The French steamer America, lately towed into New York harbor, was recently discharging cargo at the Atlantic docks. Upon her arrival in port reporters for daily papers asked the chief engineer, Lagarde, "what broke?" Mr. Lagarde is a Frenchman, polite, and without sufficient knowledge of the English language to readily answer the question. But he entered his room and soon issued forth with his technical dictionary. Opposite "Arbre de buttee" he found "thrust shaft;" upon which he volunteered the information that the thrust shaft broke through the "racing" of his engines. The America is no longer in her infancy. Any seafarer becomes aware of this fact when seeing her square-rigged mast; in fact, her engines were built by George Forrester, of Liverpool, England, in 1882.



A—THE BREAK; B—COLLARS; C—COUPLINGS; D—BEARINGS; E—THRUST SHAFT.

Taking it for granted that the break was caused by the racing of the engines, it may here be mentioned that the America does not carry a governor.

Of course, the governor in use on land engines, the centrifugal force of two rotating heavy balls being applied to shut, or to open, the throttle valve, cannot be used on shipboard. But numerous governors, however, are in the market to which the respective inventors point with pride as being the only device guaranteed to regulate the speed of a ship's engine at a time when the boat is laboring in a heavy sea.

Yes, theoretically each of these governors works to perfection, but there never was yet a marine engineer who dared trust the regulating of his engine to the vagaries of even the best of these inventions. As a Scotch engineer once expressed it: "The governor, like mustard after a meal, always comes too late."

The only known means of preventing racing is to place a man at the throttle valve to shut off steam a moment before the stern is sufficiently elevated to bare the propeller.

No man, or the wrong man, was at the America's throttle valve when the accident happened. And this accident was the breaking of the thrust shaft, the break occurring where the "collars" are.

When the boat was visited at the Atlantic docks the cargo had been removed from No. 3 hold and the top taken off from what in England is called the "tunnel," in America the "shaft alley."

The thrust bearing as well as the collars having been removed the break was plainly visible—a very uneven one. It was impossible to ascertain whether there had been a flaw in the shaft at the place of the break, for, on account of the uneven break, several cracks had been caused by the revolving crankshaft striking the obtruding part of the stationary thrust shaft.

As Mr. Lagarde observed, it is very seldom that a break occurs at just that place, and thus no coupling was carried to fit over the "collars." The engineers had then proceeded to remove these "collars," or what in the daily papers was called "threads." Any one can understand that this was hard and tedious work, especially when it is remembered that this had to be done while the ship was not underway—broadside to—in a heavy sea. But the removal of the "collars" left the propeller without a thrust—a point upon which the propeller can apply its driving force.

The chief engineer wishes it known that only the "arbre de buttee" needs to be replaced to make her engine fit for excellent future work. But upon hearing that after doing away with the thrust and adjusting a "machon d'assemblage," as Mr. Lagarde is pleased to call a "coupling," the engine was started, (though it made only a few revolutions), the writer for the MARINE REVIEW decided to interview the machinists who had been sent to make minor repairs and incidentally superintend the removal of the broken shaft. It was then learned that two new shaft bearings would have to be installed, and also that the engine was "out of kilter."

The latter is only another manner of saying that the crankshaft has been shoved forward—(the thrust, by means of the "collars," is there to prevent this) —or, that a line drawn through the center of the piston-rod will not meet the center of the crank-pin when the latter is in its highest, or lowest, position.

As for the statement in a daily paper, "the propeller, swinging loose under the ship's stern, was pounding against the tunnel's side," nothing further can be said of it than "nonsense." The moral of all the foregoing is: "Place a man at the throttle as soon as there are indications on the part of the engine that it is going to race."

Will some marine engineer describe the most efficient, perhaps the least inefficient, governor (marine) with which he is acquainted? F.H.

EXAMINATION FOR ENGINEERS, REVENUE CUTTER SERVICE.

An opportunity is now offered bright young men, who have the requisite engineering knowledge, to obtain a commission in the government service. The opportunity in question will be an examination for the position of second assistant engineer in the United States revenue cutter service. There are at present several vacancies in that grade, and an examination will be held, commencing Sept. 24, 1906, from which it is hoped to obtain a list of eligibles to fill the existing vacancies. These eligibles will be appointed cadet engineers, for a probationary period of not less than six months, and if during this probationary period they exhibit an aptitude for the service they will then be commissioned second assistant engineers.

The examination is strictly competitive, and is open to any American citizen who fulfills the following requirements:

He must be not less than twenty-one nor more than twenty-six years of age, physically sound and well-formed, and will be required to undergo a rigid physical examination before a board of surgeons of the public health and marine hospital service before appointment as a cadet engineer.

The examination, which will be written, and is so arranged that it must be completed in four days, includes the following subjects: Grammar, spelling, punctuation, composition, and penmanship, as shown by the candidate's written statement of his educational, shop and engineering experiences; elementary mathematics; elementary mechanics; practical problems connected with marine engineering; the marine boiler, including the chemistry of incrustation, corrosion, and combustion of fuels; heat, steam, and the theory of expansion; the steam engine indicator and diagrams; the marine engine, valves and valve gears, condensers, pumps and gauges; strength of materials; screw propellers; and electricity.

The standard of efficiency is placed at 75 per cent, and all those obtaining that average will be placed on an eligible list. The examination papers will be marked by a board of engineer officers of the revenue cutter service, but the examination may be taken in any large city which is most convenient to the candidate.

The pay of a cadet engineer is $75 per month, with 30 cents per day additional; of a second assistant engineer, $1,400 per annum, of a first assistant engineer, $1,500 per annum; of a chief engineer, $1,800 per annum; and of the engineer-in-chief, $2,500 per annum; and in addition thereto an increase of 10 per cent for each five years' service. Also, when on detached duty, commutation of quarters is allowed at the rate of $24 per month for second and first assistant engineers, $36 per month for chief engineers, and $48 per month for the engineer-in-chief. Retirement on three-quarters pay is provided for officers on reaching the age of sixty-four, or who may be incapacitated for active service by reason of disability incurred in the line of duty.

Vessels are stationed at all the large seaports of the Atlantic, Gulf, and Pacific coasts. There are also four revenue cutters on the great lakes, one in Porto Rican waters, one at Honolulu, territory of Hawaii, and each year several cutters make cruises to the Bering sea and the Arctic. In general, a tour of duty on one station lasts no longer than three years, at the expiration of which tour the officer is transferred to another station.

Commissions in this service are similar in all respects to those in the army and navy, and officers are liable to dismissal only for gross misconduct, after trial by a revenue cutter service court.

An application for designation to take this examination must be received by Sept. 15, 1906; it must be in the handwriting of the applicant, and must state the date and place of birth, and the state of which the applicant is a resident. The application must also be accompanied with satisfactory evidence of the good moral character and correct habits of the applicant, and certificates showing his engineering education and experience.

All applications, or correspondence relative to further information regarding this examination, should be addressed to the honorable secretary of the treasury, Washington, D. C.

STEAM SUPERHEATERS.

The battleship Britannia is the first warship to be fitted with steam superheaters, and the analysis of the results of her trials is (says the Glasgow *Herald*) interesting, as it reflects light on the economy of the system. This superheating of steam is now fairly general on land stations, but, as has been already pointed out, that which is possible on land is not advisable at sea, and the engineering branch of the admiralty is again to be congratulated on its enterprise in making a practical test of the system.

Six of the Babcock & Wilcox boilers in the Brittannia had superheaters in the uptake, and as this number was equal to driving the engines at one-fifth of their power it was decided to run two trials, each of 30 hours' duration, the one with ordinary steam, and the other with the steam superheated to the extent of 90 degrees Fahrenheit. The result was to reduce the coal consumption by about 15 per cent, and to reduce also the temperature of the gases escaping from the funnel by 50 degrees. In other words, with ordinary steam the coal consumption was 2.07 lbs. per I. H. P. per hour, as compared with 1.77 lbs. while using superheated steam. Again, on the higher power trials the influence of the superheating of part of the steam had its effect, as on the whole trial at 70 per cent of the power the coal consumption was 1.5 lbs. per I. H. P. per hour, and at full speed 1.83 lbs. It is, however, at low powers that the gain is most wanted, as then the consumption is high owing to the auxiliary machinery taking such a large proportion of the steam. Moreover, warships run for the greater part of their time at low power, so that if the gain of 15 per cent shown on trial can be maintained in service the coal bill for the year will be appreciably lessened.

1,200 TONS OF COAL A DAY.

The largest steamship in the world has latterly become a familiar phrase. It has been used several times within the past year to designate marine creations of the period, none of them holding the size distinction long. In the case, however, of the great Cunard line turbine ship Lusitania, an advance has been made in size and power—especially in power—which will probably keep her at the head of the procession for several years to come, excepting simply her sister ship, the Mauritania, in progress in the yard of Messrs. Swan, Hunter & Wigham Richardson, Ltd., at Newcastle-on-Tyne. The largest horsepower afloat up to present, *Cassier's Magazine* records, does not much exceed half that of the Lusitania, which latter, at a minimum, will be 65,000. Since the ship has four separate propellers, each of these will have to absorb, say 16,500 H. P. The steam consumption of the Lusitania turbines may probably be taken fairly at 15 lbs. per H. P. per hour. This gives for 65,000 H. P. no less than 435 tons of steam per hour, and probably not much less than 50 tons of coal in the same period, or, say 1,200 tons per day of twenty-four hours. It is not remarkable that the engine and boiler room crews number 400 men.

THE MARINE REVIEW

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SEPTEMBER 6, 1906.

MERCHANT MARINE LEAGUE PRIZE.

Prizes aggregating $1,000 are offered by the Merchant Marine League of the United States for the four best essays on "How to Build Up Our Shipping in the Foreign Trade." The contest is restricted to students of high schools, technological schools, colleges and universities. There will be four prizes, one of $400, one of $300, one of $200 and one of $100. The contest will close about Nov. 15 and prizes will be awarded about Dec. 15. Students competing must register their names and the institutions of learning which they are attending with the Merchant Marine League of Cleveland. Certainly no topic is more susceptible of diverse handling than this. To the student who desires to enter exhaustively into a study of the subject, numerous sources of information are available. Probably the most complete, and at the same time the most compact, is the report of the Merchant Marine Commission, which was appointed at the instigation of President Roosevelt two years ago to make a tour of the country and inquire into the present state of American shipping and the causes of its decline in the foreign field. This commission toured both the Atlantic and Pacific coasts and the great lakes region. In the three volumes of testimony which it accumulated scores of men submitted evidence. Some of the most comprehensive treatises on the subject of shipping are to be found in these volumes. The opportunity to acquire a fine knowledge of the shipping question and at the same time to win a considerable prize is thus offered to industrious students of American schools. Any student who enters this contest will come out of it a thorough believer in the necessity for an efficient merchant marine.

NAVAL REVIEW.

President Roosevelt had the pleasure on Labor Day of witnessing the maneuvers of the navy which the foresight of the late W. C. Whitney when secretary of the navy under President Cleveland, had created. When Cleveland assumed office, the navy of the United States was non-existent. This did not, however, prevent him from bluffing England very beautifully on the Venezuelan boundary line. The consistent policy of navy building began with that administration and has reached a partial fruition now. It is by no means complete, but it is capacious and efficient and is third in fighting strength among the navies of the world. What it will be when every state has a battleship is for the future to determine, but a battleship per state does not appear an unreasonable allowance. The vessels taking part were the battleships Alabama, Illinois, Indiana, Iowa, Maine, Missouri, Kentucky, Louisiana, Rhode Island, New Jersey, Virginia; armored cruisers, West Virginia, Pennsylvania, Colorado, Maryland; protected cruisers, Tacoma, Cleveland, Denver; monitors, Puritan, Nevada, Florida, Arkansas; torpedo boat destroyers, Whipple, Warden, Truxton, Hopkins, Lawrence, Macdonough; torpedo boats, Wilkes, Tingey, Rodgers, Stockton, Blakeley, Delong; submarines Porpoise, Shark; auxiliary vessels, Mayflower, Dolphin, Des Moines, Yankee, Celtic, Arethusa, Abarenda, Lebanon, Leonidas.

The president surveyed the fleet from the Mayflower, each vessel firing a presidential salute of twenty-one guns as the Mayflower passed. The striking energy of this fleet concentrated and measured in foot-tons is sufficient to blow the Flatiron building in New York seven and one-half miles into the air and suspend it there for thirty minutes.

LAKE TRADE.

The lake trade is expanding in all directions, not alone in bulk freight but in miscellaneous freight and in passenger traffic. Bulk freighters have been built numerously during the past two years, but as conditions prove, not more numerously than needed. The existing fleet is well employed. What is true of the bulk freight trade is true also of other trades. It is questionable indeed if the passenger lines have had sufficient steamers for their purpose during the present year. Broadly speaking, there has not been any addition to the passenger fleet for a few years past, but the population of lake cities has almost doubled in that time. The Detroit & Cleveland line is building a new steamer for its Lake Erie run. It will doubtless be filled from the start. The Cleveland & Buffalo line is contemplating the building of a third steamer. They cannot build it too soon to gratify the public demand The White Star line is thinking of remodeling the Tashmoo. What they should do is to build a bigger steamer on the general lines of the Tashmoo and put her in an express service touching only the upper resorts in the rivers. Travelers are flocking to the lakes by the thousands owing to the variety of their attractions. More passenger steamers are really needed on established routes. Ten years ago.

even five years ago, no one could have foretold the wonderful development that lake trade is undergoing. Who is wise enough to foretell what it may be ten years hence? One cannot take too broad a view of the situation. That company is wise which provides for the greatest growth, for imagination frequently falls below realities on the lakes.

ORE SHIPMENTS.

Ore shipments during August were 5,665,815 tons as against 5,009,382 tons for the corresponding month last year, or a gain of 656,433 tons. The shipments to Sept. 1, 1906, have been 22,721,095 tons as against 21,048,056 tons to Sept. 1, 1905, a gain of 1,673,039 tons. These figures practically determine the season's movement. It was hoped that the July and August movements would exceed 6,000,000 tons. During July the fleet, however, only carried 5,762,772 tons and in August, as noted, less than that. Last year the fleet carried altogether 33,473,788 tons. If the movement of the present year is to reach 36,000,000 tons, the vessels will have to move over three-quarters of a million tons more during September than they moved last September. It is not likely that they will do this. Shipments by lake will probably be below 36,000,000 tons, though the all-rail shipments will bring the total movement above that figure. Following are the shipments by ports during August and up to Sept. 1 with corresponding data for comparative purposes for last year:

	August, 1905. 190g.	August, 1906. 1906.
Escanaba	706,252	871,106
Marquette	421,685	403,331
Ashland	501,184	571,698
Superior	700,997	906,9[illegible]0
Duluth	1,433,556	1,601,941
Two Harbors ...	1,245,708	1,310,779
	5,009,382	5,665 815

	To Sept. 1, 1905.	To Sept. 1. 1906.
Escanaba	3,227,865	3,436,611
Marquette	1,882,211	1,708,937
Ashland	2,148 351	2,251,057
Superior	3,168,026	3,578,496
Duluth	5,589,491	6,584,272
Two Harbors ...	5,032,112	5,161,722
	21,048 056	22,721,095

Mr. Henry C. Barter, secretary and treasurer of the International Longshoremen, Marine and Transport-workers' association, has purchased a farm near Pontiac, Mich., which he proposes to make his home.

AROUND THE GREAT LAKES.

The coal cargo of the steamer Bulgaria has been purchased by Leatham & Smith.

Capt. F. M. Bostwick has been detached from the command of the ship Eagle and ordered to duty as assistant to the inspector at Detroit.

Comdr. Charles E. Fox, in charge of the eleventh lighthouse district, with headquarters at Detroit, has been promoted to the rank of captain.

Harry Endelman, of Algonac, Mich., who was second engineer most of last season on the steamer Watt, is on the steamer La Salle this year.

While in Buffalo last week President Antonio C. Pessano of the Great Lakes Engineering Works, Detroit, closed a contract for an 8,000-ton freighter with eastern interests whose names are withheld for the present.

Supt. Frank Jeffrey, of the Detroit Ship Building Co., says that it is hoped to launch the new Detroit & Cleveland passenger steamer at Wyandotte late in November.

The steamer Uranus, which sank the steamer Governor Smith in Lake Huron, has been put in the floating dry dock at the Ecorse yard of the Great Lakes Engineering Works.

Capt. Joe Powell, master of the steamer Grammer, brought a cargo of ore to Ashtabula last Friday. His arrival was unusual because it makes the second time in there this season.

Capt. C. E. Benham, of Cleveland, owner of the steamer H. B. Tuttle which sank at Lorain harbor as a result of its pounding in the recent gale, is superintending the work of raising her.

It is expected that the launch of the steamer W. E. Fitzgerald, building for Dennis Sullivan, of Chicago, will take place at the Wyandotte yard of the American Ship Building Co. about Sept. 16.

The schooner Katahdin, which three weeks ago rammed and wrecked six legs of the Brown hoists on the B. & O. docks at Lorain, left on Saturday last for Sarnia, Capt. McVoy giving bonds for $15,000.

The steamer City of London, coal laden, was totally disabled on Lake Superior off Manitou island last week, by the loss of its propeller wheel. Owing to the crowded condition of the dry dock at Duluth, she will probably be brought to the lower lakes for repairs.

The steamer B. F. Jones, owned by the Jones & Laughlin Steel Co., Pittsburg, and operated by the Interstate Steamship Co., of which Mr. W. H. Becker is manager, was the first vessel to utilize the new ship canal in St. Clair flats. The canal was not to be officially opened until Monday, but Capt. C. M. Ennes took the Jones safely through at noon Saturday last. A number of government officials and vesselmen were present to witness the initial navigation of the new channel.

The steamer J. G. Sharples while entering the harbor at Waukegan last week struck a rock and stove a hole in its bow. The forward compartment filled with water and the bow of the Sharples sank in shallow water. After lightering her cargo the steamer will be floated.

Walter Lawler, of Amherstburg, Ont., has been made master of the steamer E. M. Peck on account of Capt. Alex. Callam being taken off to go on one of the boats ordered last spring by Capt. Dennis Sullivan, of Chicago. Capt. Lawler has a host of friends who wish him well.

Superintendents and managers of the various passenger steamship lines running on the Detroit river, unanimously declare that the present season is the best ever recorded, all lines claiming to have had all the business that they could handle. It is certain that last year's record of 7,795,439 passengers carried will be far surpassed.

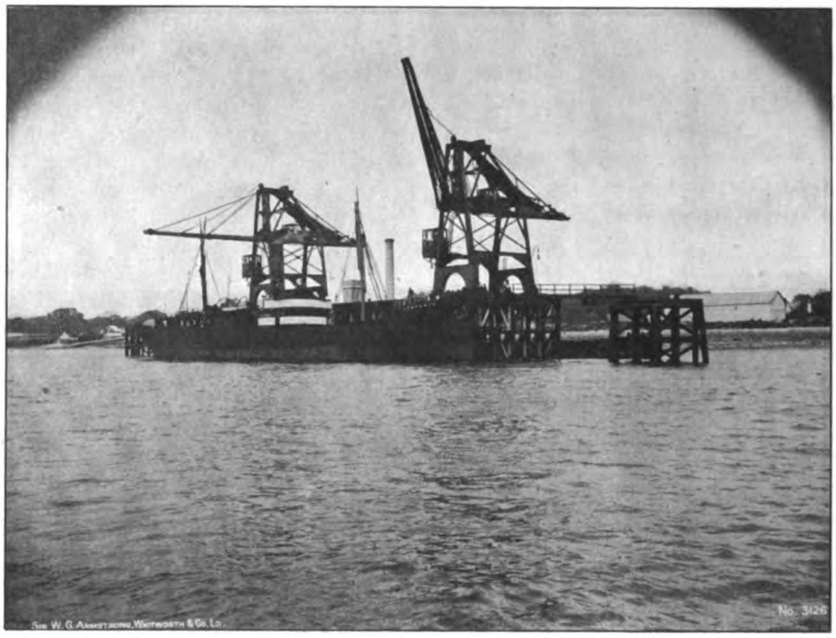
Capt. W. W. Smith, marine superintendent of the Pittsburg Steamship Co., has just concluded the last of three big wrecking jobs on Lake Superior by towing the stern of the steamer Lafayette into Duluth harbor. He had also had charge of the wrecking of the steamers Wm. E. Corey and Crescent City.

Capt. James Stone, supervising inspector, went down to Ashtabula last Friday on a momentous errand. He was born at Port Burwell, Ont., and had not been there for sixty-six years, having moved away with his parents at the age of four. Capt. Stone went over on the new P. & O. car ferry Ashtabula.

The stern of the steel steamer Lafayette, which was wrecked on the north shore of Lake Superior near Two Harbors in the great storm of November last was towed into Duluth habor by the steamer Colgate and tug Zenith last week. The forward end of the steamer was completely destroyed and the wreckers therefore built a bulkhead across the after part of the ship to save the machinery. This section was then pumped out and floated. The machinery of the Lafayette will probably be placed in the barge Manila, making a steamer out of her.

COALING FACILITIES AT PURFLEET, BRITAIN.

The ferro-concrete pier, recently erected at Purfleet by the Steamship Owners' Coal Association, is at present equipped with two rapid working hydraulic transporter cranes with grab and multiplying sheaves, working with wire ropes. The cylinders are placed on the upper part of the crane framing as shown in the illustration. The hinged jib is lifted and lowered by means of a hydraulic cylinder fixed vertically on the front of the framing.



HYDRAULIC TRANSPORTER CRANES AT PURFLEET.

buckets. The cranes are designed for lifting coal from steamer, and delivering either into barge on the river side of the steamer, into barge on the land side of the pier, or into trucks running on rails on the pier beneath the cranes. The cranes are strongly braced steel structures as shown in our illustration, each having four legs carried on roller carriages containing two double flanged rollers running on rails the full length of the pier. The gauge of the rails is 28 ft. and the wheel base 24 ft. At a level of 32 ft. above the deck of the pier is a track on which runs a four-wheeled trolley carrying the sheaves over which work the wire ropes attached to the grab bucket. The part of the track over the steamer is hinged in the form of a jib, so that it may be turned up out of the way of masts, etc. The trolley track gives a total range in traverse of 96 ft., 48 being over the jetty on steamer side, and 14 ft. on the barge side. The grabs used are of the Priestman's double rope type of the 80 cu. ft. capacity. A section of the trolley track is carried on a weighbridge built into the crane structure so that each grab load of coal can be weighed on its way from steamer to barge or truck.

The lifting, lowering and traversing motions are all carried out by means of hydraulic cylinders fitted with rams All the cylinders are controlled by valves in the driver's cabin which is fixed at one corner of the framing overlooking the steamer deck.

HYDRAULIC TRANSPORTER CRANES AT PURFLEET.

The cranes are moved along their rails by a hydraulic three-cylinder rotary engine, so that the cranes can be placed to suit the steamer's hatches.

The hydraulic pressure water is conveyed to the cranes by rubber armored hose connected to hydrants in the deck of the pier.

The cranes of which there are two at present, were designed originally to have a capacity of 50 tons of coal per hour each. In actual use, however, this speed has been considerably exceeded, upwards of 71 tons having been dealt with in the time named, by one crane, and on a recent occasion a steamer carrying 1,700 tons of coal was discharged in 15¼ hours, this time including taking out and replacing of hatchway beams, moving of cranes, and cleaning up of holds.

The hydraulic pressure is conveyed to the hydrants on the pier by cast iron pressure piping from a pumping station near the shore end of the pier, the pumping plant consisting of two compound surface condensing steam pumping engines each of about 120 I. H. P., supplied with steam at a working pressure of 130 lbs. from two double flued Lancashire boilers, seven feet six inches diameter by 30 ft. long. The hydraulic pressure is 750 lbs. per square inch, and the accumulator which automatically governs the starting and stopping of the engines has a ram 18 in. diameter with 23 ft. six inches stroke. One engine suffices for actuating the present two cranes.

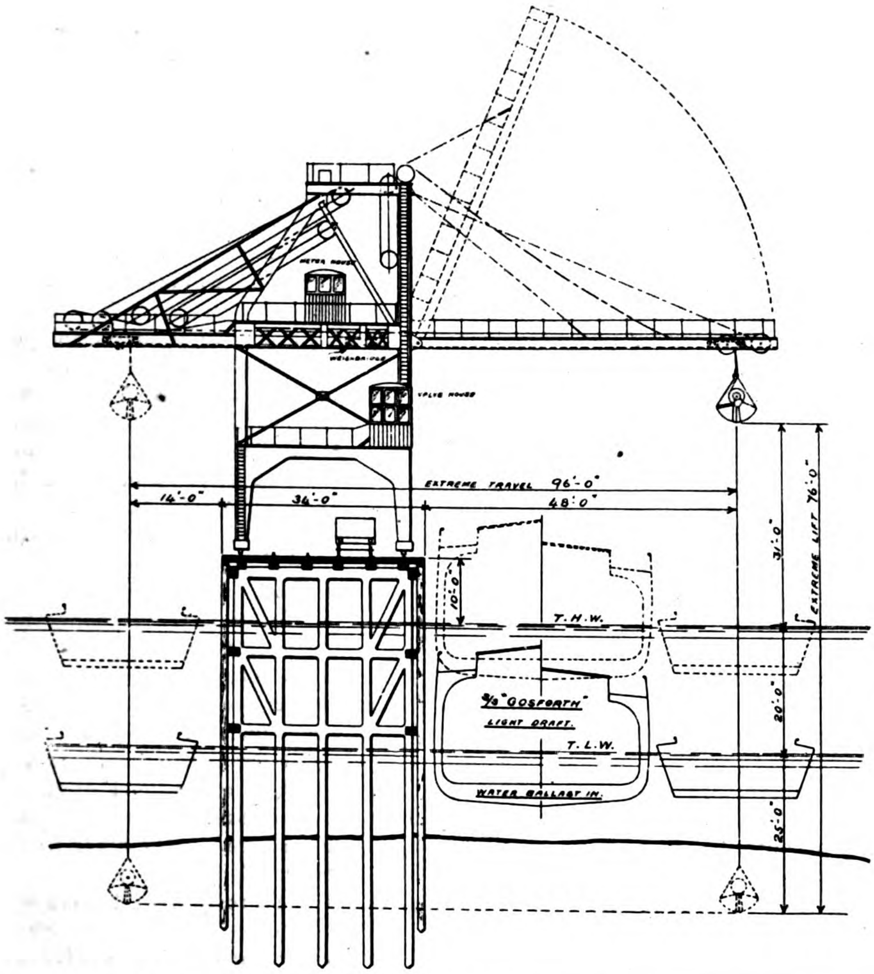
The engineers for the whole of the works were Messrs. P. W. and C. S. Meik, of 16 Victoria street, S. W., and the whole of the hydraulic plant was supplied and erected by Messrs. Sir W. G. Armstrong, Whitworth & Co., Ltd., Elswick Engine Works, Newcastle-on-Tyne.

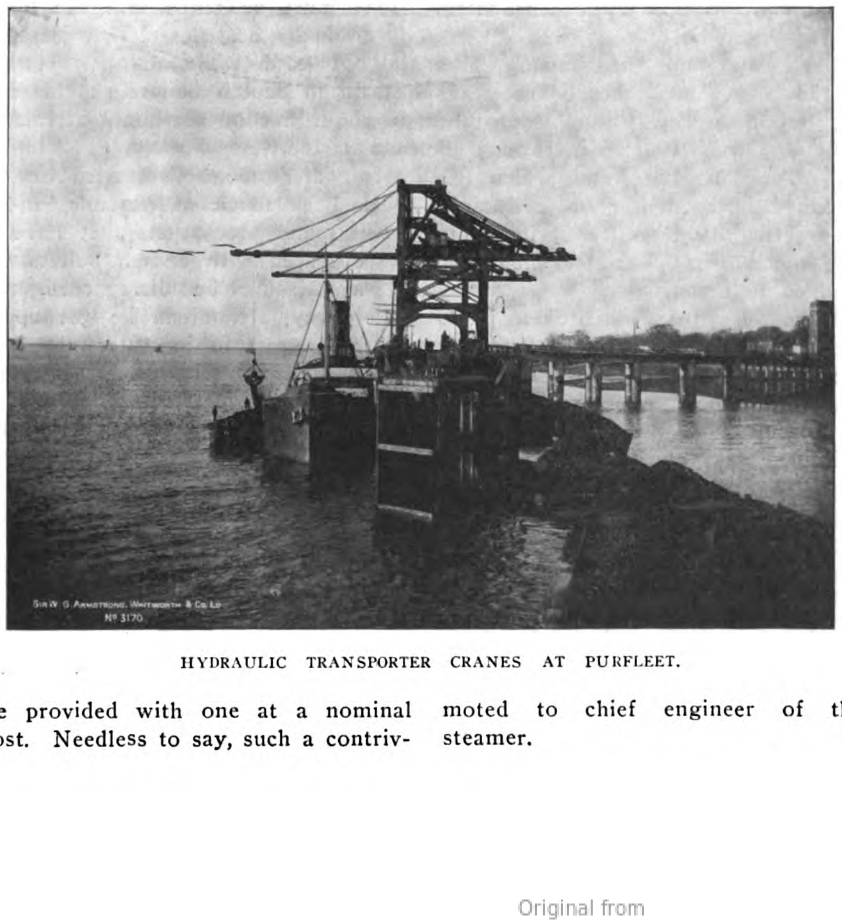
The same firm have now in hand

two more cranes of a similar type. The new cranes will not, however, be arranged to deliver coal to barges lying outside the steamer but will deliver into two tiers of barges on the land side of the pier, the outreach on the steamer side of the pier being 32 ft., and on the barge side 38 ft.

When these two additional cranes are erected, a steamer of 1,700 tons capacity will be discharged in eight hours.

4 TON HYDRAULIC TRANSPORTER CRANE.





HYDRAULIC TRANSPORTER CRANES AT PURFLEET.

INVENTION BY A LIVERPOOL CAPTAIN.

Capt. E. J. Carter, who has had a considerable amount of experience in sail and steam, deep and shallow water, and in all classes of craft (his last employ being the Leyland line) claims to have solved the problem (says the Liverpool *Journal of Commerce*) of taking a true and reliable altitude of the sun in hazy or foggy weather, or when the horizon is obscured by land or mist, without the use of an artificial horizon. This is done by means of a small attachment of simple construction, fitted to the sextant itself, and capable of use by the most inexperienced navigator. There are no weights and no adjustments, and every existing sextant can be provided with one at a nominal cost. Needless to say, such a contrivance would be a great boon to seamen, and if it possesses the properties claimed for it by the inventor, its value cannot be overestimated in the interests of life and property at sea.

The following changes have been made in the personnel of the engineers of the Pittsburgh Steamship Co.'s fleet: H. E. McIntosh, chief engineer of the steamer Griffin, has been appointed chief engineer of the Mataafa. R. W. Hunter, appointed chief engineer of the steamer Griffin, has since been transferred to chief of the steamer Crescent City, vice A. E. Buddemeyer, resigned. S. W. Armstrong, chief engineer of the steamer Stephenson, has been promoted to chief engineer of the steamer Frick. D. Fraser, formerly chief engineer of the steamer Frick, has been transferred to chief engineer of the steamer Harvard. A. J. Armson, chief engineer of the steamer Malietoa, has been transferred to chief engineer of the Griffin, account of Mr. Armson having been injured and desired to be changed to a smaller boat until he regains his health. Gus. Johnson has been temporarily appointed chief engineer of the steamer Malietoa. F. L. Smith is temporarily appointed to chief engineer of the steamer Stephenson. A. Jackson, formerly chief engineer of the Zenith City, has been promoted to the steamer Princeton, vice W. L. Campbell, resigned. S. D. Graham, formerly assistant engineer of the Zenith City, has been promoted to chief engineer of that steamer.

THE CARE AND OPERATION OF NAVAL MACHINERY IN THE ENGINEER DEPARTMENT, U. S. NAVY.

BY LIEUTENANT H. C. DINGER, U. S. N., MEMBER.

A valuable series of articles by Lieut. Dinger on the care and operation of naval machinery has appeared in the *Journal* of the American Society of Naval Engineers. They are designed to describe in a simple and detailed manner the main features in connection with the care and operation of naval machinery.

GETTING UNDERWAY.—BOILERS.

The time required preparing to get underway depends upon the type and size of the boilers in the vessel, as well as upon the character of the engines.

Ships having large Scotch boilers will require six to eight hours at least, twelve hours is better. Vessels with water-tube boilers may require less than an hour for the boilers, but it is difficult properly to warm large engines in so short a time.

The boilers to be used and the numbers of them should be selected with due consideration for the location of coal supply, and the condition of all the boilers in regard to repairs, state of cleanliness, etc.

If the boilers are empty, they must be pumped up to slightly below steaming level; if kept full of water, water is run down; the usual practice being to pump the water into some double bottom or reserve tank with auxiliary feed pump, and if no special system of piping for this purpose is fitted, use fire-room hose.

The water line at starting fires should be several inches below working level, especially in water-tube boilers. On starting up there may also be considerable water which has collected in condenser or feed tank; to prevent the necessity of its being run into bilge, this water should be pumped to boiler.

Make sure that all broken joints about the boilers are remade, and that everything is tight; that all surface and bottom blow valves of boilers not in use are closed.

Prime fires placing a thin layer of coal on grates (not done till water is at steaming level). Start fires, generally by using live coals from boilers in use.

Keep ash-pit doors closed at first and open furnace doors to allow air to reach the fire above the fuel. In Scotch boilers, start water-circulating apparatus, if any be fitted, as soon as fires are lighted. If there is no water-circulating apparatus, a circulation may be set up by putting auxiliary pump on the bottom blow of boiler and discharging into feed line. The general type of circulator in Scotch boilers is the hydrokineter, where the circulation is produced by a steam jet. By means of this device the water in boilers may be kept at 150 to 180 degrees Fahrenheit, using steam of auxiliary boiler, and under these conditions steam can be got up in a very much shorter time without injuring the boilers. With hydrokineters in use steam has been raised in very large boilers in less than two hours.

If there is no boiler in operation the fire is started with kindling wood or oily waste, laying this near front and topping it with small lumps of coal, which will take fire as the wood burns. Adding a little oil to the coal will cause it to catch fire more quickly.

The fire is allowed to burn up gradually and is pushed back as it burns, new coal being added from time to time till full thickness, six to ten inches, is reached.

After fires have been started, the fire doors are closed and ash-pit doors opened. As soon as a slight pressure is shown on gauge, open air cock to allow air to escape. Other practice is to allow all air to pass into steam line and engines during warming up boilers, tap valves being opened for this purpose, but it may not be desirable to start to warm up engine till some time after steam has been formed in the boilers.

With Scotch boilers great precautions must be taken that the boiler is gradually heated and that one part is not cold while another is hot. Steam in Scotch boilers should form in about five or six hours after fires are started.

In water-tube boilers fires can be pushed as much as possible, and a great many precautions that have to be observed with Scotch boilers can in a measure be disregarded. In emergency, steam can be got up to working pressure in water-tube boilers in 20 to 30 minutes, but it is advisable to allow at least one hour.

When steam instead of air comes out of air cock, close it. In Scotch boilers, there should be about two hours from time steam begins to form till working pressure is reached. In water-tube boilers it may be only a few minutes.

ENGINE ROOM.

About an hour before the time set for getting underway, start to warm up engines. The length of time for this depends on the size of engines. For very large engines more than an hour should be allowed; for small engines an hour is not necessary.

TO GET READY.

See all tools, material, clothing, etc., clear of engine. See all parts of engine in place and properly secured. Disconnect jacking gear. Start circulating pumps, making sure that injection and discharge valves are properly opened.

If vessel has been lying in tropical parts where there are a large number of jelly fish, the injection strainers should be blown out with steam. Start main air pumps and open main exhaust valves to condensers if valves are fitted.

Open bleeder to drain steam line, open other drains in steam line. On large vessels, and especially where there are pockets in the main steam line, as on Tennessee and Washington, great care must be exercised that steam line is properly drained.

Open bulkhead stops. Drain separator.

The draining of steam pipe is very important, for if it is not done there is great danger of water hammer and a rupture of some steam pipe.

Open boiler stop valves, unless they have been open since fires were started, just cracking them open at first, and then open them gradually. This should at first be done with boiler that has steam up, the other boilers being connected as their pressure approaches the pressure of boilers that are connected.

Get reversing engine ready and turn steam on it. Turn steam on jackets and drain them. Open cylinder drains.

See all working parts ready, oil pipes and cups clear, and wicks and oiling gear at hand; take gaskets off bearings. Put a little oil by hand on the principal pins, slides, and bearings, slack stern gland.

The steam being up to throttle, move links back and forth with reversing engine and crack open throttle slightly. This allows a little stream to pass into h. p. cylinder and warms it up. Crack open pass-over valves to allow steam to enter i. p. and l. p. cylinders.

Continue to work links back and forth, and thus get all parts gradually warmed up.

Turn steam on capstan and steering engine, when ordered from deck, and have pump ready for washing off anchor chain.

Try engine-room telegraph, also telegraph to fireroom, voice pipes, bells, telephones, etc. See that feed

pumps are in proper condition and try all that are to be used.

The boilers being connected and all main stops opened, see all oiling apparatus ready, including oil cans, oil syringes, graphite and cylinder oil for swabbing ronds. See reserve-feed tank full and oil cups filled. The boiler stop valves are never opened wide; usually 2½ to three turns of the wheel is sufficient.

An efficient aid to internal engine lubrication is to introduce graphite into cylinders just before starting. This can be easily done by mixing it with water and putting it down an indicator pipe if no lubricator cups are fitted. Circulate water through thrust bearing and slides.

Make inspection to see that there is plenty of steam, good fires, good vacuum, and everything about engines ready and all men at stations.

Permission to try engines should be obtained about fifteen or twenty minutes before time set to be ready. Permission being granted, engines are tried.

TRYING ENGINE.

Before trying engine, pass order to stand clear. Then open throttle slightly and move links back and forth. The engine will then start one way or the other. If it does not start well, it is probably due to water in cylinders which must be gradually worked out. A well-handled and properly-adjusted engine will start without manipulating pass-over valves.

Try engine both going ahead and astern and see that it reverses easily. Do not move engine more than a few revolutions, usually two, each way, as a greater amount of turning is likely to bring a strain on anchors or moorings.

After trying engines, take final look to ascertain if there is any heating of bearings or any indication of wrong adjustment; everything being ready, the department is reported ready to get underway. After this report is made, a machinist must stand by to answer any signal promptly. In trying engines, there may be several causes to prevent proper working; below are some of them.

Water in cylinders.—This will prevent the engines moving full stroke; the engine is likely to start, move a little way, and then bring up. The water must be got rid of by opening all drains and moving piston back and forth by reversing-gear till the engine will turn a complete revolution.

Engine on center.—This can be guarded against by taking care when engine is stopped that the h. p. crank is up near middle of stroke. Reversing engine, and bringing link back again, will throw most engines off the center. If this fails, pass-over valves can be used. In using pass-over valves, regard must be had for the position of cranks so that all efforts are to move the engine in the same direction. Sometimes an engine may fail to move on account of bad handling of the pass-over valves, whereby one cylinder is trying to move the engine one way and another in the opposite direction, the result being that the engine fails to move.

By opening pass-over too much at starting, in engines having attached air pumps and slide valves, a considerable pressure may be obtained in receivers, and hence on back of valves, if slide valves be fitted. This may be sufficient to prevent the moving of the links. The remedy is to close pass-overs and open drains so that pressure on backs of valves may be reduced.

This failure of reversing-gear may also take place at any time engine is stopped during maneuvering when pass-over valves are left open or a considerable pressure on slide valves is produced by other means.

Whenever an engine fails to move with a slight opening of throttle, the cause of obstruction should be found, and the engine should not be forced by opening throttle wide, as by so doing something may be broken.

Valve rods sticking.—Valve rods sometimes stick; they may be loosened by applying oil, loosening stuffing box or loosening up on valve-stem guide. Some of the moving parts may be caught in some way, and at times the jacking gear has not been disconnected.

Excess water on starting.—With attached air pumps, in starting up, a great deal of water will be thrown into tank; in such cases it is advisable to put a pump on the air-pump channel ways and pump directly to boiler. This will prevent tank from overflowing and losing fresh water in bilge.

Handling, general.—Some engines handle much easier than others, and all have some peculiarities which are only found out by experience; but a great many general features hold for all. The real handling of an engine can only be learned by practical experience where practically all the senses are developed to apply to the case.

Turning over.—When engine is turned over in answer to signal, wicks should be put in and then special lookout must be had for heating or any maladjustment.

Throttle.—The throttle must not be suddenly opened or closed, but the engine, especially if a large one, should be allowed to work up to full power gradually.

Reversing.—When reversing, the throttle should first be closed, and engine then reversed; but when the emergency signal is received (that is, a signal to back full speed when going ahead), the engine should be immediately reversed, even at a risk of breaking something. This signal should never be given from deck unless it is an emergency signal.

RUNNING ENGINES UNDERWAY.

Whenever there is any doubt or trouble in connection with the operation of the engines, the officer of the deck should be notified immediately so that he can make suitable dispositions to avoid danger.

The most laborious work in connection with the running of engines will be when steaming in squadron, when exact distance must be maintained. With same steam and vacuum and no change in links, the pressure in the h. p. and. i. p. receiver will be the same for the same number of revolutions, so that, after some running, these gauges can be used as a quick indication of the number of revolutions.

Electric revolution indicators are fitted on some vessels which indicate by a pointer at the end of every minute or half minute the exact number of revolutions the engine has turned during the preceding minute.

With well-adjusted engines and ordinary care in operation, the main engines are not likely to give much trouble.

The points to look out for in the engine room underway are, in general: 1. A watchfulness and oversight where all the senses are used to detect any derangement or improper working. 2. Keep all moving parts properly lubricated. 3. Keep water out of cylinders. 4. Keep steam pressure, links, and throttle so adjusted that engines work smoothly and economically, and that there is the proper distribution of work between the cylinders.

GENERAL OVERSIGHT AND WATCH.

The senses that come into use in connection with the operation of engines are sight, hearing, touch, smell, and taste.

The eye.—The trained eye is able to detect when various moving parts are not moving with regularity, as well as to notice movement in parts that should not be moving. The eye, of course, can detect such things as steam leaks, water leaks, cracks, and breakage.

Hearing and touch.—A great deal concerning the proper running of an engine can be told by the sounds heard in the engine room. The various sounds tend to combine into a sort of rhythm, and the experienced ear can tell when matters are going well and when even very slight deviations, from this ordinary rhythm are present, and this forms a very efficient means of detecting and locating faults.

The chief sound is the rather dull and heavy thump caused by the pounding of the main or crank-pin bearings. This can be located by observing which crank has just passed the center when the thump is heard, remembering that the thump will be heard after and not before passing the center, or by filling bearing with oil the thump will be lessened. If the bearing is felt and found to be warm, or the thump felt by other means, the knock is located. The main bearing will have a duller sound than the crank pin or crosshead and will be felt all over the structure. The crosshead knock is a sharper sound and is not heard at so great a distance.

Often lost motion can be told by feeling the bearings. Placing a piece of metal against one part and the other end against the teeth or ear will also give indications.

A valve being loose on its stem or piston loose on rod causes a solid, sharp thump or a dull click. On starting up or slowing down, slide valves are apt to rattle or cause a clicking sound due to lack of pressure on their backs.

Attached air pumps, on becoming flooded, give a heavy thump due to excess of water; or this may be caused by the absence of an air cushion, which may be remedied by opening air cock on bonnet for a moment.

Spring rings vibrate more at certain speeds and cause a rasping sound at times. Other sounds inside the cylinder are caused by moisture in the steam and by the rings and cylinder walls becoming dry. When this rasping sound is heard while engines are in free route, a little cylinder oil put on piston rod or some graphite and water introduced into cylinder will relieve the noise. Scraping and grunting, caused by water in the piston rings, is generally only heard on starting up and slowing down. The spring rings of piston valves give a sort of whistling sound when dry.

The cylinder relief valves are apt to rattle when there is little pressure on them. Stuffing boxes sometimes squeal, due to insufficient lubrication.

The churning sound noticed about engines is due to the passing of steam through ports. There is a difference in sound showing whether the port opening is ample or not. This difference may be noticed by running cutoff well in and out and observing the change.

Touch is of great use in feeling the degree of heat and to determine slight movements not otherwise noted.

The sense of smell is of great value in detecting heating or improper lubrication, as the smell of heated and burning oil can be noticed.

Taste comes into use in tasting feed water to see whether it is fresh or brackish.

HEATING.

Various moving parts are liable to heat. This is caused by (1) improper or insufficient lubrication, (2) bearings becoming out of line, (3) bearing set up too tight, (4) grit or dirt from inferior oil or from engine room getting into bearing, (5) uneven surface of bearing or brass.

Bearings must be frequently felt and special regard had for lubrication. If there is a sort of lather on the bearing, it is a sign of proper lubrication. Good oil running out shows that there is too much oil. Heating or the smell of burning oil shows a lack of lubrication.

If bearings get warm, the supply of oil should be examined and increased. If it gets warmer, water may be sprayed on or circulated through, according to which arrangement is supplied. But water should be avoided, if possible, the danger being that all parts are not cooled at the same time, and there is danger of bending, warping, or cracking, due to sudden and unequal contraction caused by the cooling effect of the water.

If the temperature of a bearing continues to rise after having increased the oil supply and we have a hot bearing, other means must be taken.

The danger of a hot bearing is that the brasses may expand till they grip the journal, thus causing a constant increase in the friction and heat. With increased heat the white metal may run. Slowing down will reduce the friction. Slacking back on cap bolts will increase the clearance and prevent gripping; but these cannot be slacked back too much, as pounding will result.

By stopping and readjusting the heated bearing, the matter may be remedied. This is probably the best way, as it is the surest. If the bearing is not large, it can be taken off, cleaned out, covered with graphite, and a liner inserted in a few minutes, and on starting off it will be alright. It is thus a very good practice to have paper and thin copper liners, already cut, at hand for all bearings, so that there is no delay in fitting them. For cooling a bearing, tallow, black lead, and sulphur are advisable as they absorb heat.

Water should not, except in most extreme cases, be sprayed on a hot bearing and should only be used before very great heat is manifested. A great objection to the use of water is that, being lighter than oil, it gravitates to the lower part of the bearing and thus displaces the oil, and after water is once started in a bearing, it is difficult to get it properly oiled. Water may be constantly used on guides and thrust bearings which are arranged hollow so that the water does not come on the sliding surfaces.

Often on trial trips streams of water are run continually on all the principal bearings, but in those cases the water is started before the heating begins. This is, however, not good practice for ordinary running.

Heating due to bearings being out of line or poor surfaces cannot be effectively remedied except by readjustment of parts, the only remedy in these cases being to run slow and to use oil freely.

OILING.

Oiling in connection with the operation of engines consists in (1) keeping the oil boxes or cups supplied with oil, (2) supplementing this supply by hand where necessary, (3) oiling by hand small bearings that do not have separate pipes, (4) lubricating piston and valve rods, (5) internal lubrication, (6) regulate water service.

The oil boxes are usually filled from a reservoir tank located in top of engine room with pipes leading to all the various boxes so that they can be filled. Where no such system is provided, the boxes are filled by using an oil measure. Oiling by hand is done with the squirt can; a small half-pint can is usually the handiest. In addition to the squirt can the oil syringe is used to reach parts that are out of the way, such as slides, piston rods, etc. For the fast-moving engines, syringes are generally used in place of the squirt can.

Piston rods and valve rods are lubricated by means of swabs, using cylinder oil mixed with graphite, also by oil syringes.

On large bearings tallow cups are provided, and these have to be filled by hand. The covers of all oil boxes and cups should be kept closed to prevent dirt from getting into oil.

There are no definite rules to be given regarding the frequency of lubri-

cating. This can only be told by experience in each particular case.

Amount of oil required.—This will depend largely on the skill of the oiler, the adjustment of the bearings and their condition, the quality of the oil, and the temperature of the engine room. In hot weather the oil will run freer and wicks should be decreased; in cool weather the oil will run slower and wicks should be increased. In time wicks rot and also become clogged, thus changing the amount of oil supplied.

Fair practice is to use about one gallon of oil per ton of coal, or one gallon per 1,000 H. P. per hour. For small engines, such as torpedo-boat engines, considerably more oil per horsepower will be used than for large engines.

INTERNAL LUBRICATION.

For vertical engines no internal lubrication is necessary other than the swabbing of rods and wiping out of cylinders and vaselineing them at times when they are opened. The addition of a small quantity of graphite from time to time as cylinders give indications of becoming dry is advisable. When cylinders have once obtained a good surface by the use of graphite, they will run well without much further lubrication.

POUNDING.

Results from three general causes. 1. Too much clearance in a journal, slide, or connection. 2. The use of too light oil on heavy pressure. 3. Improper distribution of power between the different cylinders.

The first is remedied by readjusting, and in part by slowing down or changing speed, as at certain speeds pounding is greater. By the use of heavier oil the second cause may be removed, for them a heavier and thicker film of oil is provided. The third cause is remedied by a readjustment of cut-off. Means for increasing compression will generally reduce pounding, but as a rule this can be determined from trial.

LEAKS.

The stuffing boxes as well as various joints may leak slightly. These leaks make themselves visible by the issue of steam or water. Steam joints are likely to leak slightly on starting up when there is considerable water in the pipe, but as they become hot and water is driven away they again become tight. Tightening up on the bolts of such joints slightly will often stop the leaks, provided the gasket is still good.

Stuffing boxes, when they leak, may usually be set up while running, but care must be taken that they are not set up too tight so that they do not produce excessive friction or cause the rods to become hot. It is better to have a little steam leak than to have a hot rod. With well-fitted metallic packing there is little danger of either excessive leak or of great friction, and for all rods of any size metallic packing is fitted. It must be remembered that all steam leaks are a direct loss of power as well as of fresh water, and the loss by leakage sometimes amounts to five per cent of the total steam used.

PRIMING, WATER IN CYLINDERS.

The presence of water in cylinders is dangerous, especially in quick-moving engines having small clearance spaces. A great many broken cylinder heads and other serious accidents have been due to this cause. The pressure of water is shown by a cracking or snapping noise when there is not very much, and by a heavy, sharp thump when there is considerable quantity. The relief valves cannot very well take care of this because the pressure comes all of a sudden at the end of the stroke. When the pressure of water is noticed, the drains should be opened. If this does not relieve the cylinder, close down throttle somewhat, thus wire-drawing the steam more. If the water still increases, the throttle should be closed further, steam line drained, and the cause of the priming looked for at the boilers and there remedied.

Separator.—The separator must be kept drained, for if a large amount of water collects it may go over in a mass to the engines, thus defeating the very purpose for which the separator is fitted.

JACKETS.

Most large engines are fitted with steam jackets. These are very useful in warming up cylinders since they distribute the heat to all parts of the cylinder walls. Most engines have all cylinders jacketed; others have only the I. P. and L. P. cylinder jacketed.

The office of the jackets is to prevent liquefaction in the cylinders, and they thus increase the economy of the engine, the jacket steam giving up its latent as well as its sensible heat to prevent the steam in the cylinders from condensing. Since none of the heat of the jacket steam is lost in the condenser, its apparent theoretical economy is very great.

Considering the action of the steam alone, the most efficient practice would be to carry full boiler pressure in each jacket, but due to mechanical consideration, such as strength of castings, etc., this is not done, and if jackets are used the steam pressure in each should be kept slightly higher than the pressure in the corresponding receivers in order that the jacket steam may be hotter than the steam in the cylinders.

With slow-moving, medium pressure, long-stroke engines, jackets undoubtedly result in economy, but with high-pressure, high-speed, short-stroke engines, there are various mechanical considerations that tend to reduce the advantages from their use. With that class of engines it has also been demonstrated by experience in some special cases that jacketing has little advantage in economy.

High-pressure jacket steam causes the cylinders to become hot and dry, prevents steam from being moist, and thus reduces the natural lubrication in the cylinders. This results in what is known as scrooping. When this is noticed the jacket pressure should be lowered. The steam being dry and likewise the rubbing surfaces, there is considerable friction, as well as wear, with attending difficulties, scoring of cylinders and breaking of rings, so that though jackets may have an economy, other troubles brought about by their use may at times be sufficient to make it inadvisable to use them. As the greatest troubles, due to friction and wear occur in the h. p. cylinder, where there is probably the least economy due to their use, it would appear that jackets should only be used on the i. p. and l. p. cylinders.

In cold weather it would seem to be more advisable to use jackets than in warm weather. It is very possible that the use of high-pressure steam in jackets is responsible for many troubles experienced with cutting of cylinders, breaking of rings, and increased internal friction. These difficulties can, however, be overcome by proper design and lubrication.

(To be Continued).

The department of docks and ferries, of New York city, has just awarded contract to the Harlan & Hollingsworth Co., Wilmington, Del., for the construction of three municipal ferry boats for service between the battery, Manhattan, to Thirty-ninth street, Brooklyn. The new ferry boats will be 209 ft. long and 45 ft. wide. They will have two compound engines, driving a shaft running from end to end, with a screw propeller at each end. There will be four boilers, five transverse watertight bulkheads and both steam and hand steering gear. The bid of Harlan & Hollingsworth Co. was $635,000, and the contract calls for delivery of the boats July, 1907.

QUESTIONS FOR MASTERS AND MATES.—NO. 8.

116. If the sun's azimuth (bearing) is N 115° 15′ E at 8:10 A. M. for a given date and place, what will its bearing be at 3:50 P. M. of the same date?

117. What is the "opposite" time of 7.50 A. M. on the face of a clock?

118. If the sun bears E by S at rising for a given date and place, what will its bearing be at setting for the same date and place?

119. What is the length of a degree of longitude on the equator?

120. What is the length of a degree of longitude on the parallel of 60 degrees north or south?

121. When the sun's declination is south, does the sun rise and set bearing north or south of the east and west points, for an observer on the lakes?

122. How many minutes of arc in 0.6 of a degree?

123. Two boats start from the same point, one steers N by E 100 statute miles, and the other N by E 100 nautical miles. At the end of each course how far will each boat be (in its own miles) in a direct east and west line from the meridian on which they started?

124. What is meant by the lead or pitch of a propeller wheel?

125. How many pounds in a gross ton, or long ton?

126. How many pounds in a net ton, or short ton?

127. How many cubic feet in a marine ton, such as in figuring the tonnage of a vessel?

128. How many cubic feet in a ton of hard coal?

129. Why is it that a vessel carries more tons than her cargo space calls for, or either her net or gross tonnage?

130. What is a safety curve on a chart? What is it used for?

QUESTIONS FOR WHEELSMEN AND WATCHMEN.—NO. 9.

Give all shoals and principal land marks passed on either hand.

92. Steering on South channel, Grosse island ranges on a dark night with North channel, Grosse island ranges not visible and can't locate red stake at lower end Fighting island, what turning mark have you so you can bring stern of boat on or nearly on North Grosse island channel ranges?

93. Tell how to navigate a steamer from red stake at lower end Fighting island to head of Belle island.

94. What good mark is there to bring stern of boat on Sandwich Point to abreast Woodward avenue, Detroit?

95. What mark would you have stern of boat on and what mark would you head on from lower end to upper end of Belle island?

96. Explain how to navigate a boat from head of Belle island to entrance to St. Clair ship canal.

97. What turning mark have you to turn in Grosse Point cut, what do you head on and what do you have stern of boat on?

98. How is Grosse Point 20-ft. channel marked?

99. What is the distance from lower end of Grosse Point cut to lightship?

100. What is the width of Grosse Point cut channel?

101. Tell how to navigate a boat from St. Clair cut to Canadian club house.

QUESTIONS FOR OILERS AND WATERTENDERS.—NO. 5.

41. Does the vacuum gauge enable you to tell what pressure there is in the condenser?

42. If a vacuum in a pump was 28 in., how high up a pipe would the water rise if the vacuum in condenser is 24 in.?

43. Through what valves, pipes and chambers does the steam pass from the boilers until it is in the form of water in the hot well?

44. With a condensing engine, what valves are on the skin of the ship in the engine room and in the fire hold?

45. What is a sluice valve, what attention would you give them?

46. Explain the action of a steam lubricator, what will take place should you apply cold applications to the outside?

47. Why is soda sometimes put into a boiler, what kind is generally used?

48. When the engines are stopped with steam up, what are to be shut and what are to be opened?

49. What precaution should be taken in using a bilge injection?

50. What evil effects are produced by scale, of what does it consist, in what part of a tubular and Scotch boiler does it collect most?

WHEELSMEN'S AND WATCHMEN'S COURSE.

Editor MARINE REVIEW:—A word in regard to questions now running in the MARINE REVIEW for wheelsmen and watchmen, I would like to say that I am very much interested in them and intend to try for one of the prizes mentioned. These questions all seem to be just what we want to help our ambitions. They are asked in a plain way without stunning our minds with complex nautical terms and are what you should have secured for us long ago, as they might have given us the confidence in ourselves to think that we were fit to try for our certificates. Hoping all the boys may take the same interest in these questions.

C. A. SMITH,
Steamer Kensington.

Duluth, Minn., Aug. 23.

FREIGHT SITUATION.

During the latter part of last week everything conspired to bunch vessels at Lake Erie ports. The westerly winds seriously lowered the water at the Lime Kiln crossing so that the larger carriers were stalled above the crossing for hours, causing them to arrive in groups at Lake Erie docks. Every effort was made, however, to facilitate dispatch when they actually arrived in port. Both men and machines worked with a will, many boats being worked out Saturday night. Special effort was made on the steamer Corey at the Conneaut docks, four Huletts and four Brown electrics discharging 9,900 tons of ore in four hours and 17 minutes. This is unusually fast time, but it is not record time. Details of this unloading will be given in another issue. It is interesting to note, however, that the Corey passed Detroit at nine o'clock Saturday morning and arrived at Conneaut about one o'clock Sunday morning. She passed Detroit again on her up trip at 10:40 Sunday night, having made the run from Detroit to Conneaut and back in 37 hours and 40 minutes, discharging meanwhile a cargo of 9,900 tons of ore.

The new steamer J. H. Sheadle, building for the Cleveland-Cliffs Iron Co., at the Ecorse yard of the Great Lakes Engineering Works, will probably be launched on Saturday, Sept. 22. The Sheadle is a duplicate of the new steamer Michigan and Ishpeming, and her carrying capacity is 10,000 tons. Capt. John M. Johnston will bring out the new steamer and Thomas Durkin will be her chief engineer.

The Nau tug line, of Green Bay, has instituted suit in the United States court at Milwaukee for the recovery of damages from the Green Bay Transportation Co. for running down and sinking the tug George W. Bennett in Green Bay, Aug. 18. The steamer Saugatuck was attached but was released upon a $12,500 bond.

AT HEAD OF THE LAKES.

Duluth, Sept. 3, 1906.—For some time past the Allouez docks have been complaining of a scarcity of boats which has not only reduced shipments but has crowded the docks uncomfortably for storage space. At the Missabe docks the same condition has been true intermittently but there in turn the docks are congested by the arrival of a fleet of boats as during last week from Friday morning to Sunday when fifteen boats were there continuously and two were held up in the bay. Loading was also delayed because of the lack of proper ores for some of the cargoes. These conditions are not unique, but are particularly aggravating following close on delays aggregating 48 hours from weather conditions. The transfer yards laid out at Proctor where the scales are located, have since they begun to be used two months ago proved of great assistance in handling the ore. Now the various ores for the different groups which are loaded out of certain docks are separated out of the trains at Proctor, avoiding the necessity of transferring on the docks as formerly.

The new 550-footers Mather and Riddle were loaded at the Duluth docks for the first time last week and the loading was carefully watched to note the adaptability of the 60-foot beam to present loading devices. The Mather used sections in loading two feet longer than ordinary, and, while she will be able to be loaded only at docks No. 3 and No. 4, no difficulty was experienced. The shipment record for August is as follows:

	Two Harbors.	Duluth.	Superior.	Total.
Aug. 21-31, '06	431,486	563,211	191,097	1,185,794
Aug. 21-31, '05	426,037	498,720	233,611	1,158,368
Increase	5,499	64,491	*42,514	112,454
Aug., 1906.	1,256,883	1,585,922	906,960	3,749,765
Aug., 1905.	1,251,365	1,419,221	700,988	3,371,574
Increase	5,518	166,701	205,972	378,191
July, 1906.	1,288,625	1,783,086	917,761	3,989,472
Decrease	31,742	197,164	10,801	239,707
Total to Sept. 1, 1906.	5,122,036	6,518,430	3,578,496	15,218,962
Total to Sept. 1, 1905.	5,018,358	5,533,597	3,220,979	13,772,934
Increase	103,678	984,833	357,517	1,446,028

*Decrease.

There are several noteworthy facts brought out in the above table, principally that the shipments from each of the three docks were less in August than in July and the total falling off amounted to 239,707 tons. It also appears that the Allouez docks handled less in the past ten days than in any other seven days during the month. However, the shipments during the first three weeks of the month last year were so small that the total for August, 1905, was less than this year's total by over 200,000 tons. It is easy to see where the great activity is when we note that of the 1,466,028 tons increase this year, nearly a million of that has been gained at the Missabe docks. With one-half of the new No. 4 dock working the attempt will be made to ship 2,000,000 tons from Duluth during September.

Compared with the total shipment of 754,934 bushels in grain trade a week ago, only 680,558 bushels were moved from the head of the lakes during the week under review. The receipts and shipments of grain compare as below. The rate still remains at two cents to Buffalo.

	Receipts Aug. 25.	Receipts Sept. 1.	Shipments. Aug. 25.	Shipments. Sept. 1.
Wheat	98,430	73,027	264,246	420,906
Corn ...	707			14,147
Oats ..	70,383	139,286	182,108	89,932
Barley..	96,781	107,528	62,157	85,066
Rye	13,259	9,525		
Flaxseed	98,983	95,056	246,423	70,507

During the past week the Page Transportation Co. was incorporated at Duluth to operate the schooner M. W. Page, formerly registered at Detroit for O. W. Blodgett of Bay City. Herbert R. Spencer, Fred P. Houghton and David W. Stocking were the incorporators and the capital stock which will probably be in property as provided for in the charter is to be $50,000. The Inter Ocean Steamship Co. of Duluth, of which G. A. Tomlinson is president, has amended its certificate of incorporation so that the capital stock is now $300,000.

On the afternoon of Aug. 31 the stern of the Lafayette from the twelfth hatch back was towed into Duluth by the steamer Colgate, Capt. A. G. McLeod, and the tug Zenith. It was a novel and a difficult task bringing the hull in, and over two hours were required to navigate the last few miles into the canal. The wreck is now resting on the bottom in Howard's pocket near the ship yard, awaiting the work of transferring the machinery. The method of raising her was described in the MARINE REVIEW of August 2.

The strike of the freight handlers at the Duluth docks has been settled, and the men have returned to work accepting the straight 35 cents an hour. The situation as it is now is set forth in a statement by superintendent E. C. Blanchard of the Northern Pacific.

"The men have voluntarily returned to work, without any concession having been made on the part of the Northern Pacific, except that when the strike was inaugurated and we found ourselves short of men, we advanced the wages from 30 to 35 cents an hour. All conditions and customs are the same as in the past. The strike was very honorably conducted by the men and there will be no discrimination against them unless their actions warrant it in future. But the men who have worked on the Northern Pacific docks during the strike will be retained as long as they desire and their services are satisfactory, in preference to men who apply for work after August 28."

Printed notices will be posted at the Northern Pacific docks as follows:

"All men who have worked on Northern Pacific docks during the period from August 20 to 28 inclusive, will be retained in preference to men hired after August 28.

"The wages during the balance of the season of navigation, 1906, will be 35 cents per hour for all hourly men, with other conditions the same as in the past."

The congestion of coal boats at this port has been materially relieved during the past week, but there is less storage space unfilled on the docks and some grades of coal are well filled up.

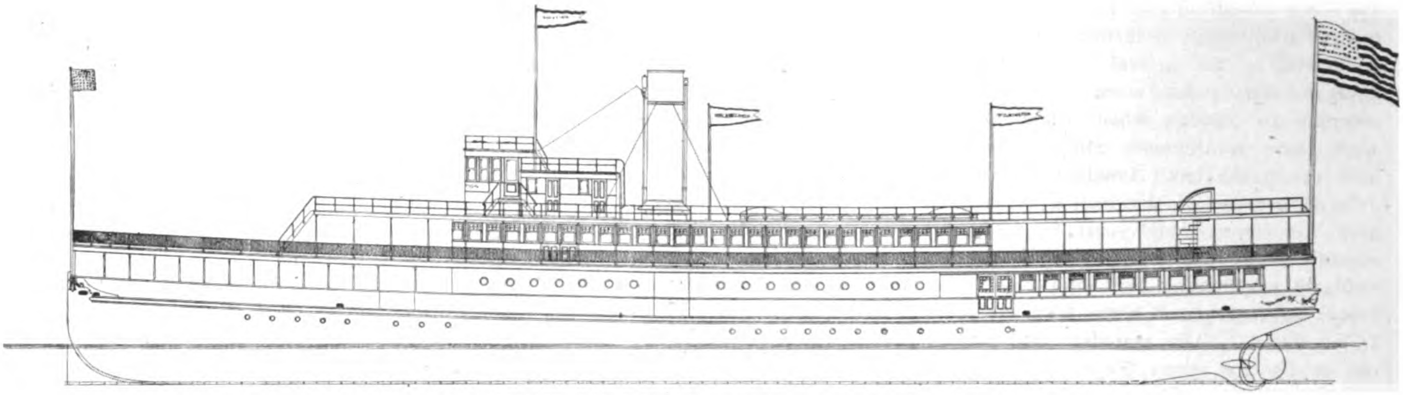
Barclay, Curle & Co., Ltd., launched from their ship building yard at Whiteinch, Aug. 20, a large steel screw steamer for the Indian service of the Anchor line, of the following dimensions: Length, 440 ft.; breadth, 53 ft.; depth, 32.6 ft. molded, with a gross tonnage of 6,200 tons, and a deadweight capacity of 8,000 tons. The vessel, which has been built to the highest class of the British Corporation, will be fitted with triple-expansion engines, the cylinders being 29½, 49 and 81 in. in diameter with four feet six inches stroke, and will have three large double-ended boilers. There will be ten powerful steam winches, one of them, with warping ends, being placed on the poop for facility in handling the vessel in port.

The United States army transport Sheridan, is ashore on Barber's Point, island of Oaku, on which Honolulu is located. She is lying broadside exposed to a heavy surf. The Sheridan was formerly the British steamer Massachusetts.

The steamer Samuel Mather, on her maiden trip, loaded 11,028 gross tons of ore at Duluth for South Chicago. The Mather is 550 ft. over all and 60 ft. beam and was built at the Wyandotte yard of the American Ship Building Co.

SMALL PASSENGER STEAMER FOR RIVER SERVICE.

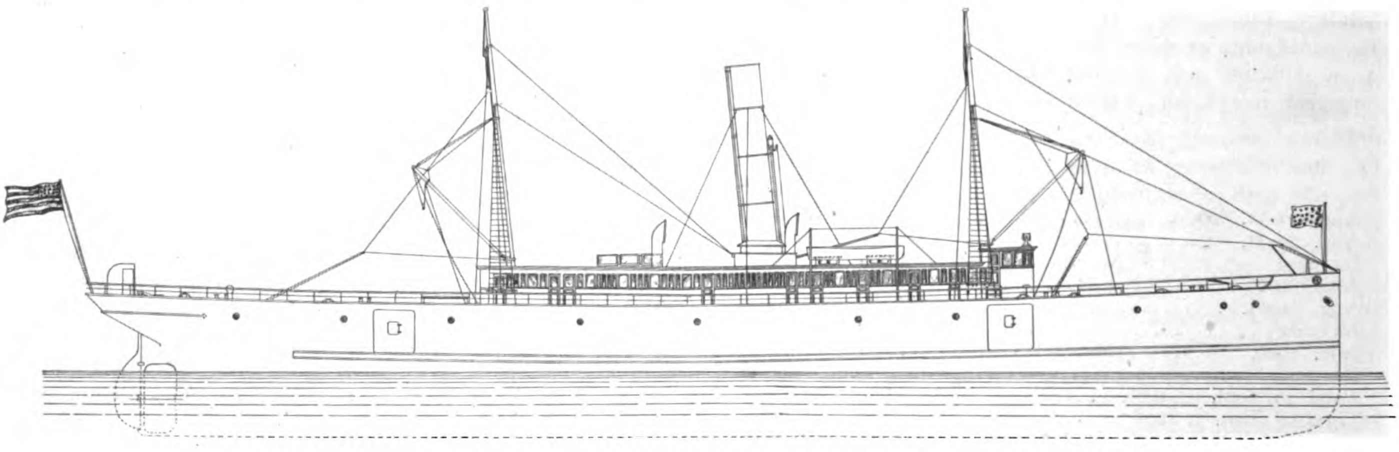
Mr. M. C. Furstenau, consulting marine engineer and naval architect, 308 Walnut St., Philadelphia, has recently designed a small passenger steamer for the Delaware River Steamboat Co., for service in the passenger excursion trade on the lower Delaware river. The principal dimensions are: 200 ft. long over all; 28 ft. molded breadth; 38 ft. over guards and 10 ft. molded depth. The hull is to be entirely of steel and the inside finish to be of quartered oak. The machinery will consist of triple-expansion engines, 18, 30 and 42-in. cylinder diameters by 36-in. stroke. Steam at 107 lbs. pressure will be supplied by two cylindrical boilers.



PASSENGER STEAMER FOR DELAWARE RIVER SERVICE.

FREIGHT STEAMER RALEIGH.

The freight steamer Raleigh, which was recently built by the Maryland Steel Co., Sparrows Point, Md., for the Baltimore Steam Packet Co., is 233 ft. eight inches over all, 222 ft. keel, 33 ft. beam and 23 ft. deep. She is equipped with a triple-expansion engine and Scotch boiler and has two masts with leg of mutton sails.



FREIGHT STEAMER RALEIGH.

THE LOSS OF THE BRITISH BATTLESHIP MONTAGU.

The abandonment of H. M. battleship Montagu, after the amount of money spent and effort put forth in the attempt to salve her, has been anything but satisfactory. The decision was only come to after several unsuccessful attempts to float the ship had been made, and when it was plainly evident that the ship was breaking up, and would not be possible to repair even if floated. The lifting of the ship was from the commencement problematical, but under the circumstances she could not be left, while a prospect remained of saving her. After the ship had been strained in the one attempt made to move her, she would have required to be practically rebuilt for her frame showed unmistakable signs of stresses due to the action of the seas and her position on the rocks. The question of stability, too, was one which could not be ignored, and the theoretical findings of the admiralty dock yard experts would probably have been proved totally wrong in practice. The conditions under which the Montagu would have floated, had she come off, were such as could not be expressed in calculable terms, hence the complicated investigations as to freeboard and stability were practically worthless. Repairs would have cost a fabulous sum of money, but the spending of a matter of $200,000 in the effort to save a nearly new vessel which cost something like a million and a half pounds sterling was more than justified. The Montagu was one of the six battleships of the Duncan class which had the standard armament of that time, viz., four 12-in. and twelve six-inch guns, the latter in casemates. The high speed of 19 knots was only obtained by sacrificing armor protection, the belt being only seven inches thick. She was launched in 1901 and was of 14,000 tons displacement. It will be remembered that on May 30, near low water, in a dense fog, she ran on the rocks at the southwest corner of Lundy island in the Bristol channel, a spot well known and dreaded by mariners.

The *Financial Chronicle*, of Chicago, in its last issue publishes a flattering biography of Mr. W. J. Wood, of Chicago.

LAKE SHIP YARD METHODS OF STEEL SHIP CONSTRUCTION.

BY ROBT. CURR.

The same material in a half-inch thick plate made square would measure three and one-half inches of a flange while the plate with the one and seven-eighths radius would give a flange of five and three-quarters wide.

This is approximate to show why errors are made when punching holes in the flange of the plate without considering if the flange will be three and one-half inches or five and three-quarter inches when finished.

The operation of flanging determines the radius of the heel of the flange whether it is very round or sharp.

It effects a great saving in cost and time to have work of this kind done by this method of punching before flanging and by finding out the amount of material necessary to do the work there is no fear of results.

In Scotland all the work would be taken from the vessel when the ship's frames were in place and faired up. The keel and center keelson plates are usually laid off with molds, same as on the lakes, and after the keel and keelson has been erected, ribbands, B Fig. 50, made of stout timbers are placed level with the under side of the channel floors, being propped up with shores and braced so that the frame lines 94, 95, etc., remain square to the keel and center keelson.

The keels of vessels are laid to a declivity of half an inch to the foot, or thereabout and in order to have the material in a fore and aft direction, square to the keel, a plumb board is used, as shown by Fig. 54. A-B is the plumb line and A-C the declivity line. A line with a weight attached is hung from where the line C intersects A-B and when it swings on to the line A-C the material is considered plumb and right.

The girder stiffeners are faired up and the plumb tried on same and if they are out of plumb the stiffeners D, Fig. 50, are forced in place with wood braces until they are plumb, then the template, C, Fig. 50, is placed against the girder stiffeners and the rivet holes copied on to the template with whitening. The template is then placed on top of the plate and the rivet holes transferred from the template with reversers (tools made for the purpose). The template being long and awkward to get into the vessel between the ribbands, it is the practice to make the template in two pieces when they exceed sixteen feet long. A, Fig. 50, shows how the templates are butted together.

Fig. 48 shows the girder plate put in place and the template for the intercostal A. The template is taken out and the plate marked similar to Fig. 46, and then punched, sheared and flanged, the same as on the lakes, Fig. 47.

On ocean-going vessels great care is taken to have the intercostal plates fit closely to the floors and above same.

This is considered helpful when the vessel comes under hogging strains, because the plate picks up the strain which is likely to come on the rivets if these intercostals are short and do not fit snug to the floors.

Fig. 51 shows a piece of girder ready for tank top angles across ships.

Fig. 52 shows the side framing in way of a side stringer. B, the ribband holds the frames in place, which are faired up similar to the bottom work.

C shows a template for the side stringer, this may be in two or three lengths, just as the plater desires.

The clips A are riveted on to the frame before it is erected and the stringer template is held to the line of clips in the square body, but at the ends of the vessel a line is run in for the side stringer and the clips put on to the line the same being riveted before the stringer is put in place.

Fig. 53 shows the method of marking the side stringers. The template is laid upon the channel and fastened with grabs, the holes A are transferred on to the channel by means of a batten punch, which is very thin at the end. The center of the rivet-hole on the wood is pierced by striking the punch with a hammer and making a punch mark upon the metal.

A marker is used for making a ring, the punch mark being in the center.

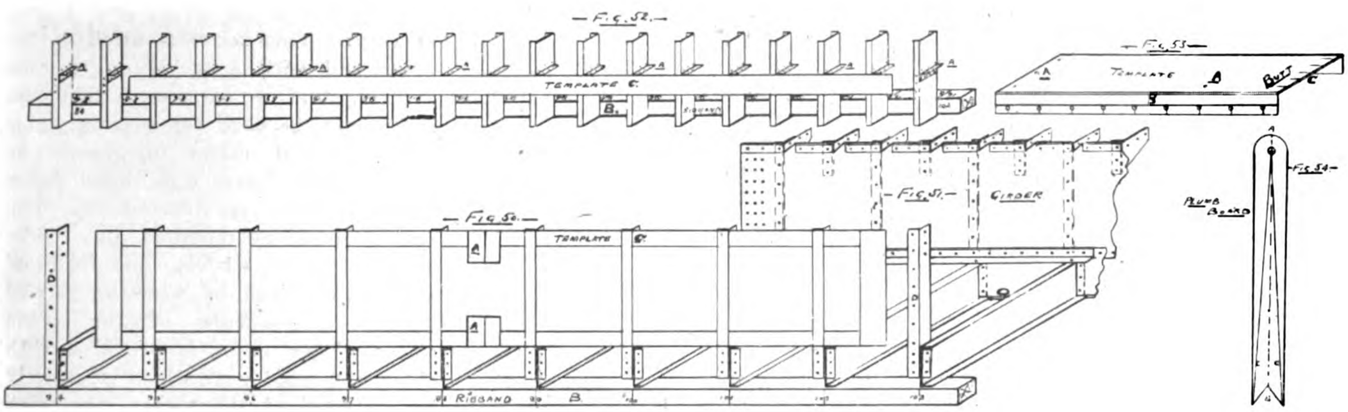
The butt marks shown at C are transferred on to the template from the channel already in place. Care being taken in having the butt rivet holes in both pieces in a fair line.

The line B, Fig. 53, shows the method of marking the flange of channel.

Line B is put on with a gauge and the holes marked on same, as shown by ring marks. The ring marks are not put on, simply the chalk mark made at right angles to the line. The puncher then punches all the holes to this line, which seems the most convenient way for him.

In Scotland the cost of girder plate, Fig. 50, to mark, punch and put in place would be four dollars and thirty-seven cents ($4.37), bottom angle, two dollars and sixty-four cents ($2.64), side stringer channel, Fig. 52, five dollars and seventy-six cents ($5.76) and intercostals, Fig. 46, forty-five cents ($.45).

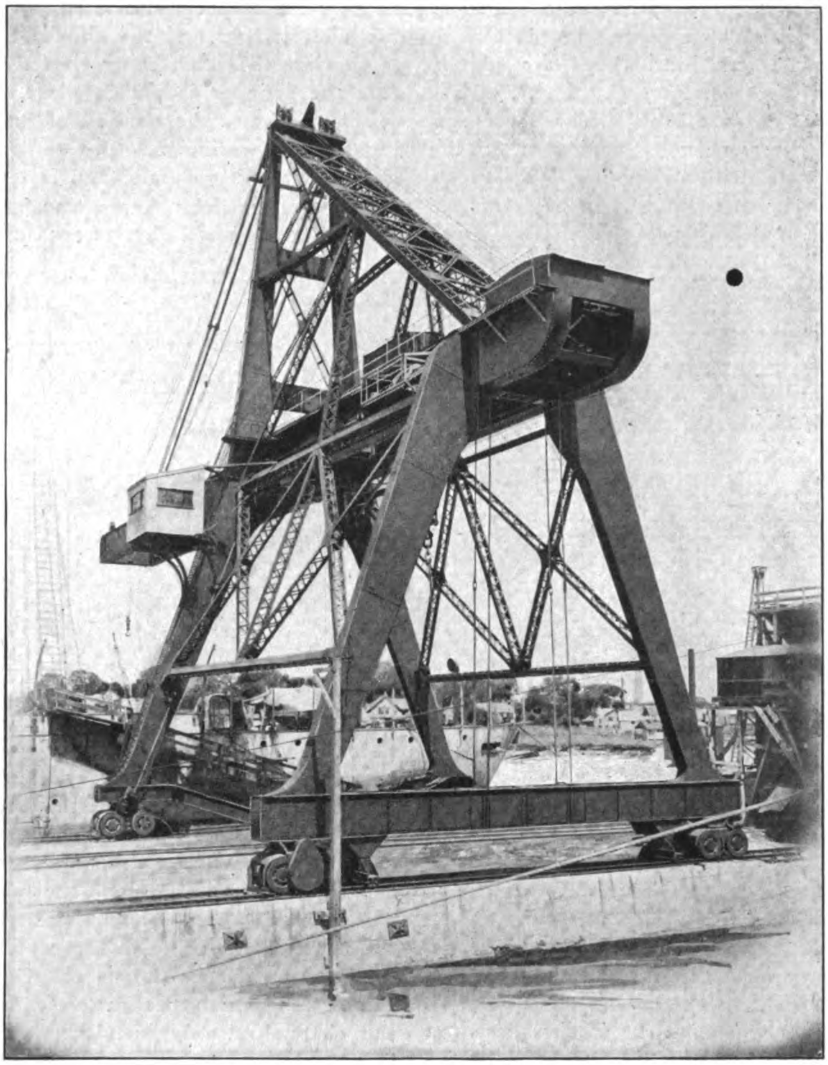
On the lakes the work is done for one-third of the Scotch prices.



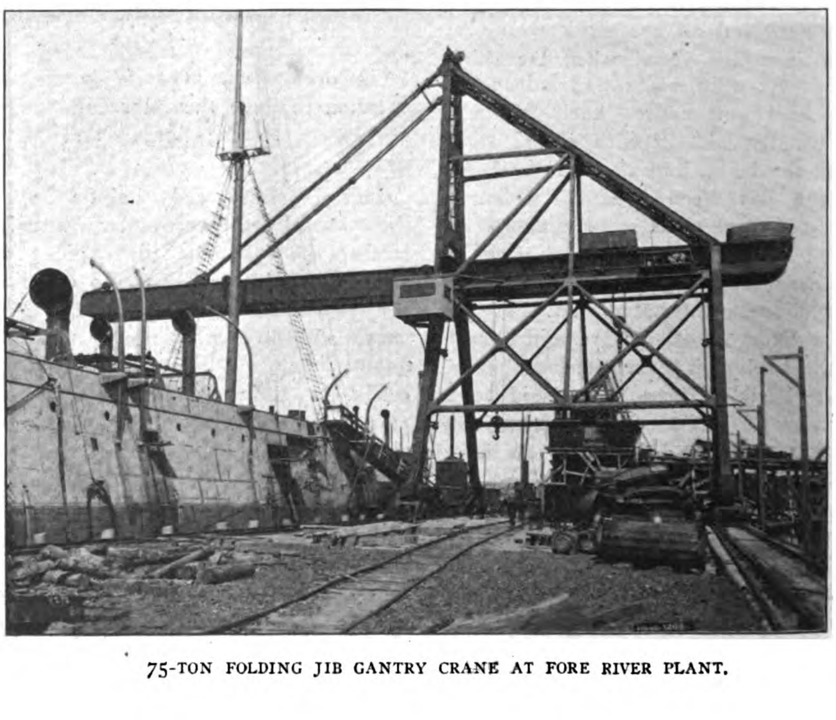
A NOTABLE SHIP YARD CRANE.

In the May 3 issue of the MARINE REVIEW, in the article descriptive of the Fore River Ship Building Co.'s yards, at Quincy, Mass., brief mention was made of the large folding jib electrically operated gantry crane shown in the cut on page 28 of that issue, the crane being in view between the United States battleships New Jersey and Rhode Island. We are now enabled to present additional views and details of this crane, which is an exceptionally notable example of special ship yard equipment and was installed by the Wellman-Seaver-Morgan Co., Cleveland, O. The crane was specially designed to meet the requirements of the Fore River company, and is particularly well suited for fitting up vessels, after being launched with the necessary boilers, engines, guns, turrets, masts and all heavy machinery. It is installed on the out-fitting pier which is 1,000 ft. long, and is arranged to travel along tracks parallel to the dock. and to handle the material from tracks under the crane to vessels, or vice versa. The crane has two hoisting trolleys respectively of 50 and 25 tons capacity, and an equalizing beam is provided by which the capacity of both trolleys may be combined, giving the crane a maximum lifting capacity of 75 tons. This arrangement is shown in the upper right hand figure of accompanying photographs of drawing No. 20,477. The arrangement of the crane is such that loads may be lifted from any position along the docks and transferred to any position required or placed aboard ship lying alongside of the dock. The boom, or that part of the girder hanging over the water and forming a runway for the trolleys is so designed that when not in use it may be folded up so as to be clear of the masts and rigging of ships. This boom is fitted at the outer end with a tackle of 10 tons capacity and so arranged that the crane may be used for placing fighting tops and masts in vessels as shown in the lower right hand figure of drawing above referred to. The entire crane is mounted on trucks equipped with wheels, one pair of which are driven by a motor carried on the frame-work of the crane above. This motor is provided with change-of-speed gear which is entirely independent of the motor, the high speed being used when carrying light loads and the slow speed when carrying heavy loads.

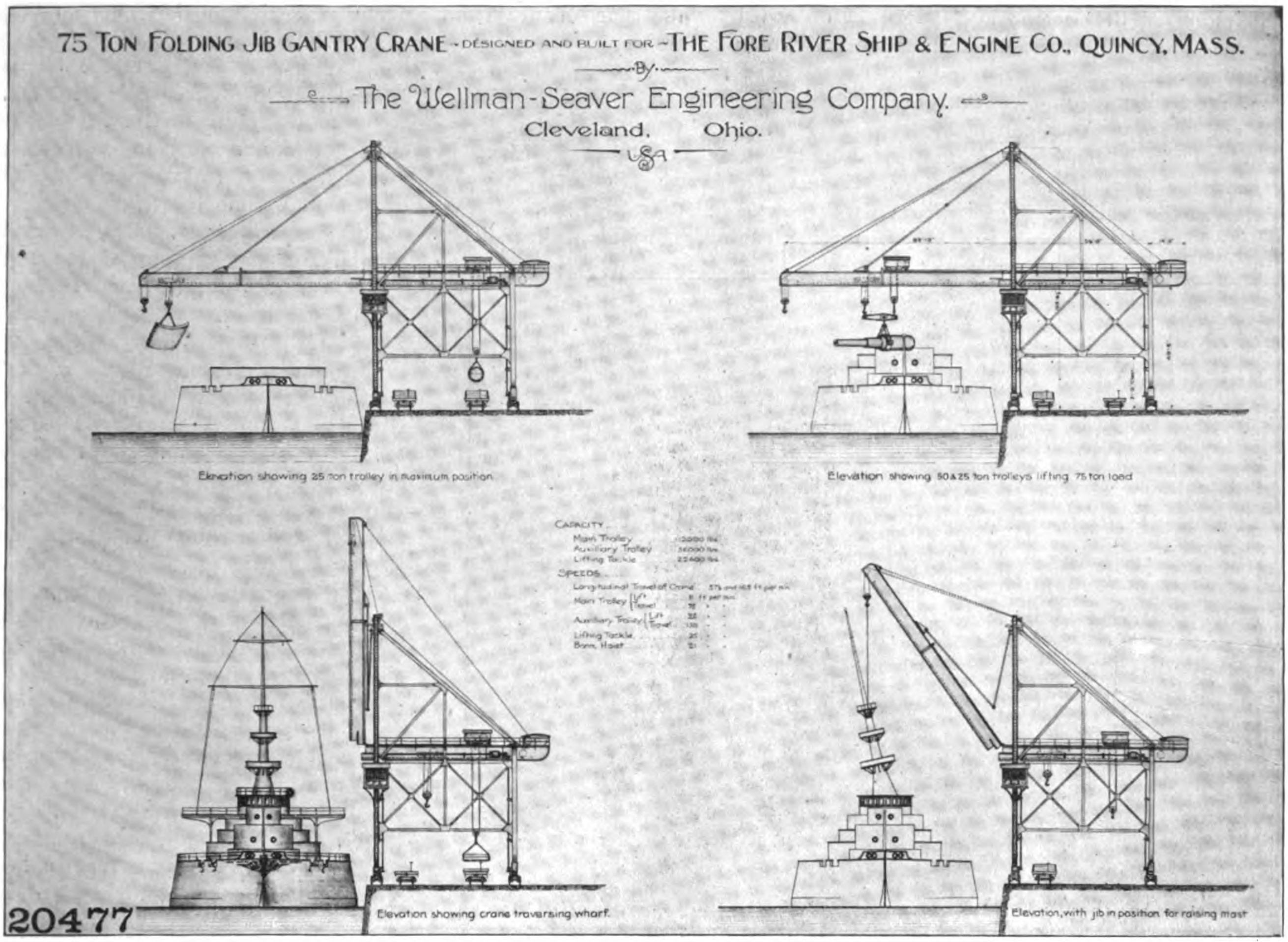
Each motion of the crane is provided with an independent motor, there being in all seven motors on the crane. An interesting feature of the crane is that the trolleys are entirely independent of each other, the 50-ton trolley being carried on rails on the upper flanges of the girders and the 25-ton trolley on the inner lower flanges of the girders, so that when the trolleys are not connected by the

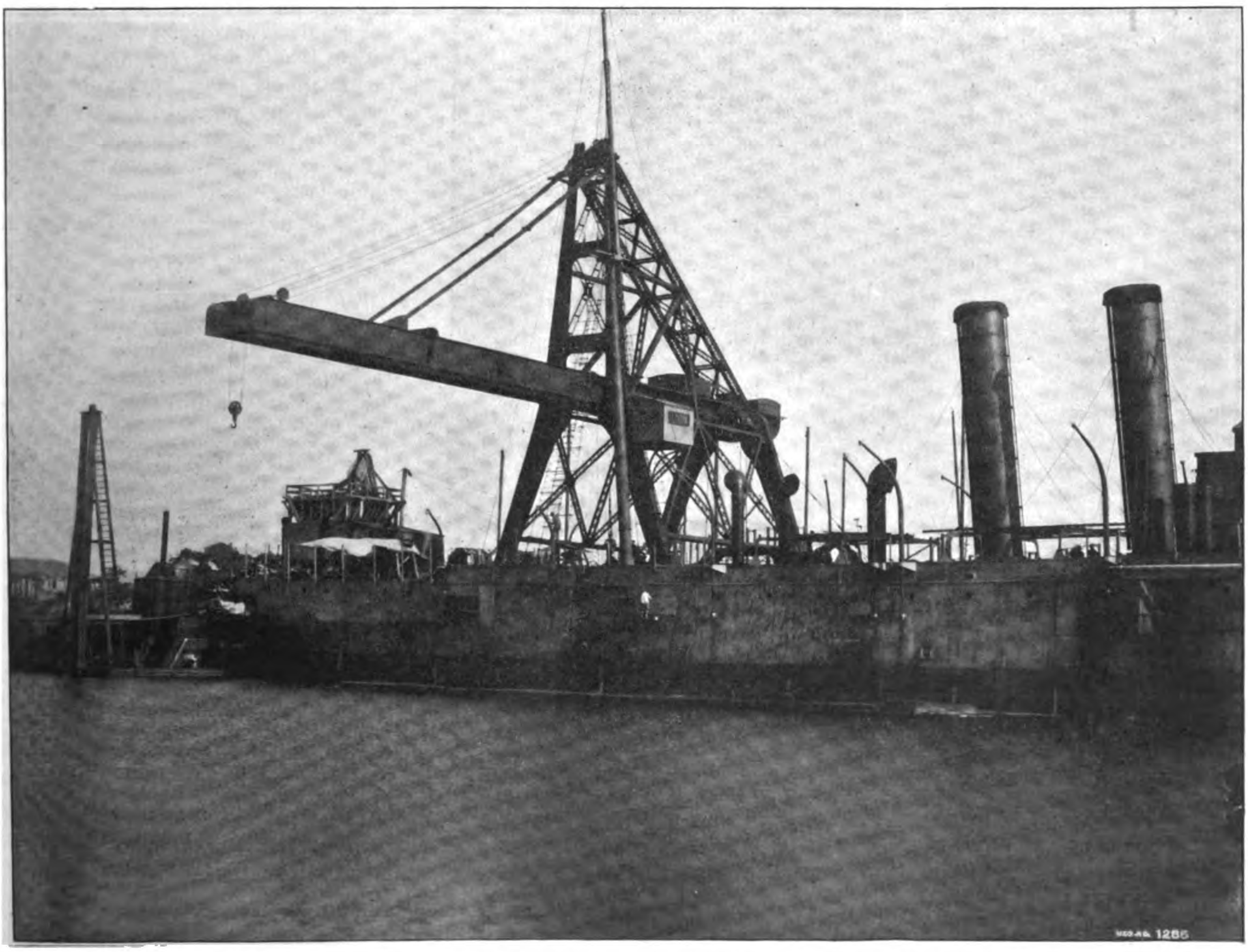


WELLMAN-SEAVER-MORGAN 75-TON FOLDING JIB GANTRY CRANE AT FORE RIVER SHIP BUILDING CO.'S PLANT, QUINCY, MASS.



75-TON FOLDING JIB GANTRY CRANE AT FORE RIVER PLANT.

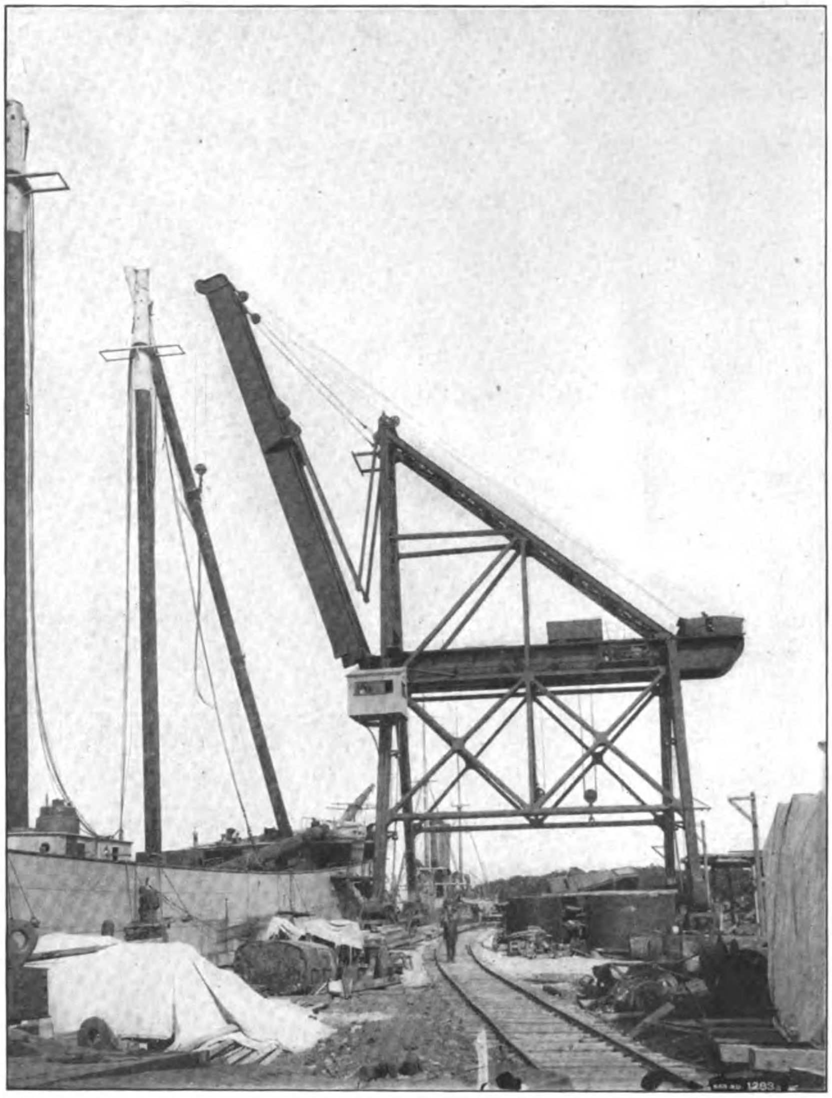




75-TON WELLMAN-SEAVER-MORGAN GANTRY CRANE AT FORE RIVER SHIP BUILDING CO.'S PLANT, QUINCY, MASS.

equalizing beam they may travel back and forth independently and without interfering with each other.

The mechanism for hoisting the boom and for operating the tackle at the end of the boom, also the motor and gear for traveling the crane are placed over the rear leg, so as to form a counterbalance to the heavy loads carried at the extreme end of the boom. Also, the counteracting effect thus secured is augmented from the fact that the lower girder which connects the legs at the rear of the crane is of box form and filled with scrap iron.



SHOWING JIB PARTLY RAISED AND CRANE AT WORK ERECTING STEEL MAST IN LARGE SEVEN-MASTED SCHOONER.

All the motions of the crane are controlled by one operator from the cab carried at the side of the front tower.

The speeds of the various motions of the crane are as follows:

Travel of crane on track, slow speed	57½	ft. per minute.
Travel of crane on track, high speed	165	" " "
50-ton trolley hoist	11	" " "
25-ton trolley hoist	22	" " "
Main trolley travel	75	" " "
Auxiliary trolley travel	150	" " "
Lifting tackle at outer end of boom	25	" " "
Boom hoist	21	" " "

A REVERSING TURBINE.

The *Shipping Gazette,* London, says: About a year ago there appeared in these columns a description of a small rotary engine, the invention of two marine engineers, which differed from all other engines of the rotary type in that it could be reversed. That engine, working only with a single cylinder, is still doing good work at a wharf on the Thames. In the meantime, however, the inventors have improved upon their early ideas, and have incorporated the same principle in a two-cylinder engine, to which the name Palindrome has been given.

The Palindrome is a direct expansion, reversible, rotary engine, steam-driven, which develops the same amount of power when running in either direction. The engine reverses instantaneously in response to the movement of one lever.

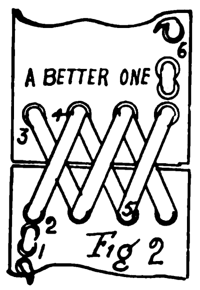
This reversing process is extremely simple, and the turning of the lever which reverses the engine results in no jar or strain, as the steam itself acts in the nature of a break, the power beginning immediately to work in the opposite direction. The principal advantages which are claimed for the Palindrome are instantaneous reversibility, high efficiency, economy, reduction in vibration, cheapness in manufacture, and saving in weight and space occupied.

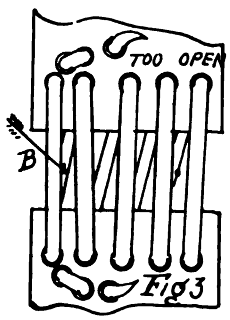
A 14-H. P. engine of this type now working at Miller's wharf has been seen by a representative of the *Shipping Gazette.* The machine was run at a high speed, and reversed with a view to demonstrating its practical adaptability for either land or marine work. Steam at a pressure of about 50 lbs. was taken from an 8-H. P. boiler, and the engine was soon running at 564 revolutions per minute. The best evidence of the lack of vibration was supplied by the placing of a cup of water on the engine, when it was running full speed. Not a drop was spilled, notwithstanding that the engine was not in any way fastened to the floor. The reversing motion was carried through by pulling over a lever, the engine taking up speed in the opposite direction practically immediately.

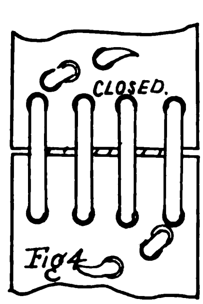
The inventors, who are justly proud of their engine, say that the Palindrome system is adaptable for triple-expansion engines up to any horse-power needed—sufficient, in fact, for driving the largest liners afloat, and that with an increase in size there is a large reduction in economy of working. The engine is equally adaptable for use in power stations, or in motor work generally. Everyone now knows that sea-going steamers propelled by turbine engines labor under the disadvantage of having to carry with them special reversing turbines, which are only used in emergency, or when maneuvering in the narrow waters of harbors or docks. This admitted disability is entirely overcome in engines of the Palindrome type, and it is principally because of this advantage that a useful future may be anticipated for an invention which owes its genesis to the co-operation of two practical seafaring engineers.

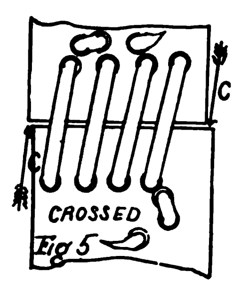
THE BELT OF THE GAS AND GASOLINE ENGINE.

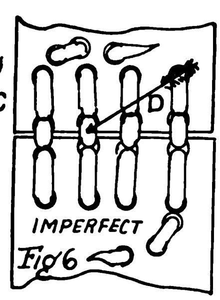
In this article we will deal with the little problem of the driving belt of the gas and gasoline engine of the boat. We have all seen motor boats idle because of some defect in the pro-





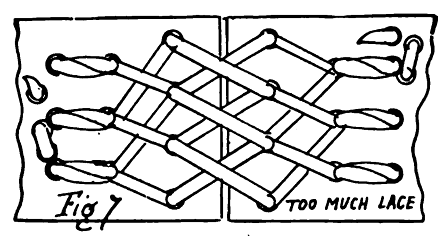


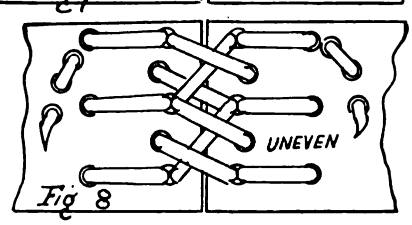


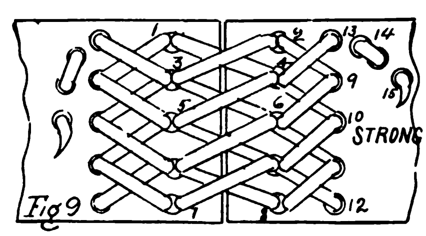


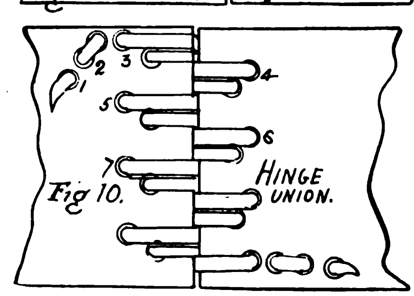
pelling mechanism. Upon investigation we have found the engine and related parts to be in perfect order, while the belt transmitting the power from one shaft to the other is in such poor condition that the transmission is irregular and the resulting speed imperfect. We have seen repairmen overhaul the ignition system, tinker with the sparking devices, and alter the electrodes and other parts in order to overcome some defect which is really due to a poor belt or a poor uniting and adjusting of the belt. In one case a splice was run on the engine of a motor boat in the condition exhibited in Fig. 1. The lacing was not only poorly aligned, but the ends of the leather were uneven and partly open so that an unsteady motion was developed every time the part (A) passed over the driving pulleys. The owner of the boat felt sure that the engine itself was not up to the standard. Then the old belt sewing was removed, the ends of the belt squared and a joint made like that in Fig. 2, after which there was no further trouble with the power transmitted by the engine. To make this style of union, you first punch your holes in even line across each end of the belt and then start the lace at 1. Here get a grip on the leather by making a double entry as shown and then go to hole 2. You then cross to 4, then to 5 and so on to the opposite edge.

Then you double back in the reverse way to the first side again to take in hole 3. From this point you simply repeat over to the other edge once more and then get a final grip on the leather with the closing end as at 6. In another case the owners of the motor boat complained about defective speed of the engine, and had attempted to rectify supposed errors by substituting a balance wheel of excessive and unnecessary diameter for the









wheel originally furnished on the engine by the experienced builders of the same. Of course the bulky wheel only made matters worse. An examination showed that the fault was in the mode of uniting the belt. The condition in which this belt was found is presented in Fig. 3. A considerable sized gap was made at b. Every time the gap struck the wheels an unsteady motion occurred and loss of power resulted. It was an easy matter to remedy this by simply tightening in on the laces, thereby closing up the gap as in Fig. 4.

I have in mind a case in which poor service with an engine on a motor boat resulted from the wabbling of the belt. It seems that the owners of the outfit had had occasion to take a piece out of the belt to tighten it. In relacing the joint they failed to lace straight, so that as the strain on the belt occurred, the slanting laces gradually pulled the edges of the belt off, making protruding points as at c, c, Fig. 5. This threw the belt out of a running line and at every turn, the belt ran from side to side on the wheels, describing an "S" line. This motion of the belt had a tendency to make the motion of the engine irregular. Thumping sounds were created. The noises ceased when the belt union was properly squared and united. Fig. 6 is a somewhat odd case. An ingenious individual made the union as shown in the cut and almost as soon as it was put on the wheels of the engine, the holes pulled out of the leather, due to punching and lacing too close to the edge as indicated at d. The holes should be put through far enough back to assure plenty of leather room for security. Sometimes odd combinations are found that are so liberally furnished with lacing that the union gets over its tour on the wheels only with difficulty. The speed of the lighter engines is often handicapped by combinations such as is exhibited in Fig. 7. Here we have a series of unnecessary lacings. The system of lacing exhibited in Fig. 8 would be as strong and just as effective as the collection of laces in Fig. 7, providing that the unevenness were done away with in the former. In this plan of lacing in Fig. 8, a moderate length of lace leather is used, and the holes are so punched that there is an effective distribution of the strain on the leather. But the crossing of the laces in the middle is not uniform. Hence, the draft will be irregular and the union will not be perfect and will have a tendency to wear out prematurely. In cases in which a strong and at the same time flexible union is desired, the system of lacing exhibited in Fig. 9 may be used. Start with a good long lace by putting one end up through hole 1, and the other through No. 2. Get the middle of the lace leather here, so that each of the long ends will be alike in length. Then go to No. 3 from No. 2 and to No. 4 from No. 1.

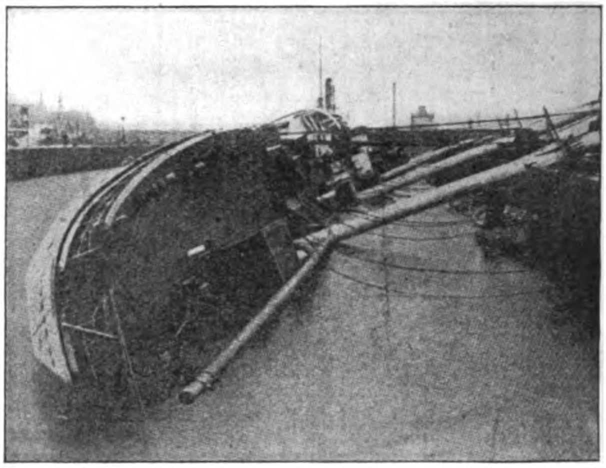
Repeat this to No. 5 and No. 6 and so on to the last holes at No. 7 and No. 8. Then you simply double back

over the same tracks to holes No. 1 and No. 2. Now the exterior line of crosses must be made. Take the one end on the right first and go from No 2 to No. 9. From No. 9 to No. 6 and so on to hole No. 12. Then you go back by crossing to No. 8 and upwards to No. 13 once more. Then you clinch the end at No. 14 and 15. Do the same with the lace on the other side and the union is then complete. In some cases you need a very "Hinge-like" union for engine service. This style of lacing is shown in Fig. 10. Punch the two lines of holes as shown. Use one lace only, and not much of it. Begin with a grip at No. 1 and go to No. 2. Then insert the lace into No. 3 and drop down between the ends of the belt and come up through No. 4. Then drop down between the juncture of the belt again and come up through No. 5. Repeat this to No. 6. Then go to No. 7. Pass along this way to the end with the single lace. You will find that the system of lacing will work well on speedy wheels of small diameter. "BOATMAN."

A LUCKLESS TRAINING SHIP.

Public attention in all parts of the maritime world has been drawn to the great misfortune which has befallen the Belgian people by the foundering of the training ship Comte de Smet de Naeyer, and the interest in the disaster has been accentuated by the remembrance that it was this ship which turned turtle in the James Watt dock, Glasgow, where she was fitting out shortly after being launched, in October, 1904. The eventful career of this ship during the brief period she has been afloat, and the great loss of life which has attended her total loss will make interesting reading the following narrative of her history and misfortunes:

The vessel was built at Greenock and launched in October, 1904, by the Grangemouth & Greenock Dock Yard Co. She was constructed of steel, and was 2,204 tons gross register, her dimensions being: Length, 267 ft.; breadth, 41 ft. 1 in.; and depth, 23 ft. 6 in. Her owners are the Association Maritime Belge, of Antwerp. As shown in the illustration the Comte de Smet de Naeyer capsized in the James Watt dock, Glasgow, as she lay alongside being fitted out. She was a sailing ship and naturally rather cranky without any ballast in her, consequently when her starboard tanks were filled with water, the ship gradually heeled over until she was gunwale under. Fortunately she went over slowly, and gave the workmen an opportunity to get ashore safely. The reason of the Comte's turning over was said to be due to the communication between the port and starboard ballast tanks being either choked up or of insufficient area, and as the starboard tank was receiving all the water from the pumps, on the day of the accident, that side of the ship became considerably heavier, and, naturally, she turned over. The salvage operations on the ship proved both interesting and exciting. As soon as possible the top hamper on the masts, which were lying on the quay, was removed, and the ship secured to the dock side by steel hawsers passed under her bottom and fixed to the masts. All openings in the plating, both under and above the water, were closed and donkey engines set to pump the water out. Two cranes were run up alongside to give a lift on the masts, hawsers were led across the dock to the opposite quay with which it was hoped to right the vessel; but unfortunately the wire ropes holding the ship to the near wall snapped when the strain came on them. However, after further efforts put forth by the Glasgow Salvage Association officials she was eventually righted, and subsequently completed and delivered to her owners.



COMTE DE SMET DE NAEYER.

It is presumed that the latter received a heavy subsidy for carrying out their intention to build a sailing ship to trade as an ordinary carrier, and also to train a large number of officers for the government service. Accommodation for some 60 cadets was provided, but only about half of this number were on board when the casualty happened. The vessel was on a voyage from Antwerp to Port Natal, and was reported all well off Ventnor on April 14 last. A few days later, however, the French ship Dunkerque brought news to Dover that in a squall off Ushant in latitude 47-12, longitude 14-30 on April 19 the ship foundered, taking down with her 36 valuable lives. Among the saved men were two second lieutenants, two professors, one doctor, and only 12 of the 30 cadets aboard. After being but a little over a year in commission thus ends the career of a ship which had such an ominous commencement. While the cause of the disaster is the subject of official inquiry, it would be presumptuous to offer an opinion, though in the meantime the suspicion cannot but be generally entertained that the unfortunate craft was crank. In fact, support is lent to this belief by reason of the fact that some of those who had previously sailed in her, left because of lack of confidence in her sea-going qualities.

STEAMER JAY GOULD.

Editor MARINE REVIEW:—I notice in the MARINE REVIEW an item from Duluth with reference to the steamer Jay Gould, which I would like to correct. The Jay Gould was built in Buffalo by Mason & Bidwell and launched in the fall of 1867 for the Union Steamboat Co., then just organized, it being the first boat built for that company. She went into commission in the spring of 1868, with Capt. Frank Brown, of Cleveland, in command and Peter Burns as engineer.

She was built to carry freight only and was a money maker till the bigger boats began to come out. She was sold to Leopold & Austrian, of Chicago, in 1882 or 1883. They made a passenger boat of her and ran her to Lake Superior, till a couple of years ago when they went out of business. Who she was sold to I did not know till I saw that she was in the hands of Capt Rattray. She was a well-built boat as were all the boats that come out of the Bidwell yards. Along in the early 70's she carried many loads of railroad iron at $2.50 a ton free in and out and many loads of grain at from 15 to 25 cents a bushel. She was good for 1,100 tons on 12 ft. six inches draught.

Chicago, Aug. 22. A. VINCENT.

The new steamer Seattle Spirit, which was launched at Ballard, Wash. last week, is built by the Smith Roman Rotary Engine Co., of Seattle, and will be fitted with two of their rotary engines. She is to be fitted with a water-tube boiler, especially designed for the use of oil fuel, having 2,600 ft. of heating surface. As soon as the plant is connected the propeller engines and boilers will be given a severe test.

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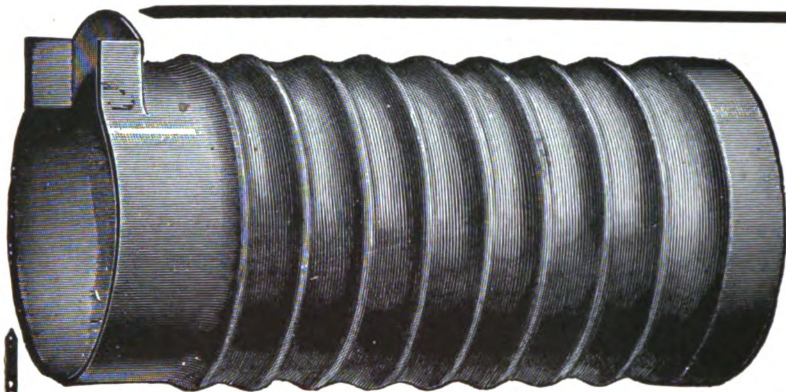
THE MARINE REVIEW

VOL. XXXIV. CLEVELAND, SEPTEMBER 6, 1906. No. 10.



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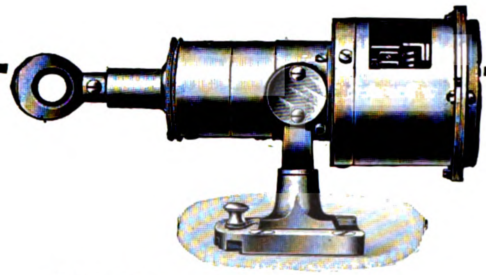

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"CHERUBAL" SHIP-LOG

("CHERUB" MARK II)
With ball bearings.

The Register of this Log is fitted with a **SLIDING CASE** to allow of the wheel-work being oiled while the Log is at work. The above illustration shows the Register with the case open.

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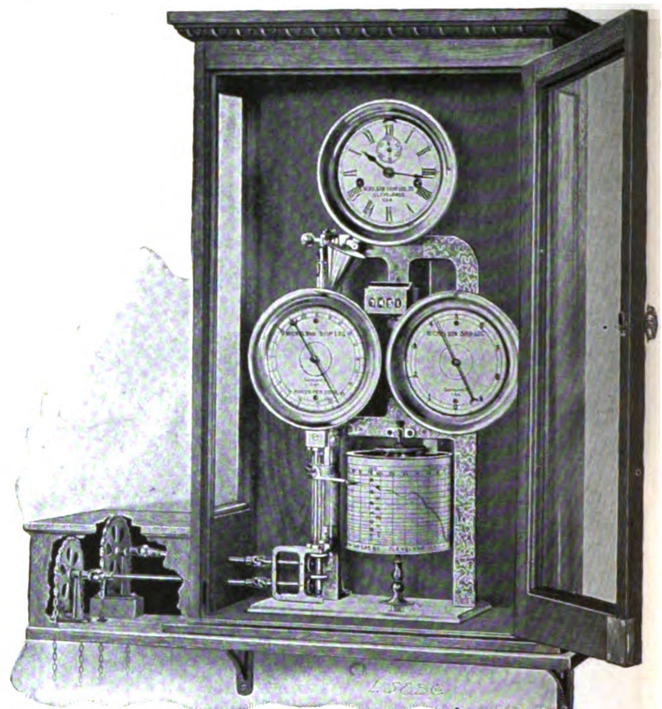

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SHIP, MACHINERY, embodying the latest designs and many important patented improvements.

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Established 1857

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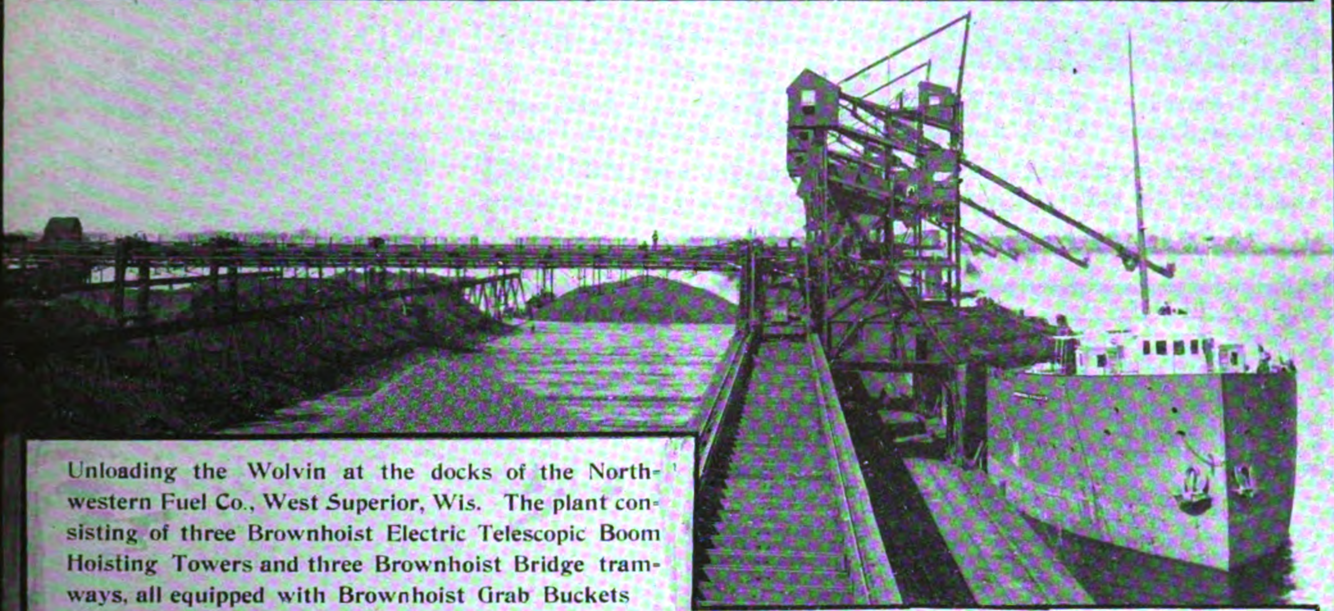

Unloading the Wolvin at the docks of the Northwestern Fuel Co., West Superior, Wis. The plant consisting of three Brownhoist Electric Telescopic Boom Hoisting Towers and three Brownhoist Bridge tramways, all equipped with Brownhoist Grab Buckets

THE BROWN HOISTING MACHINERY CO.

Engineers, Designers and Manufacturers of Hoisting Machinery of every description

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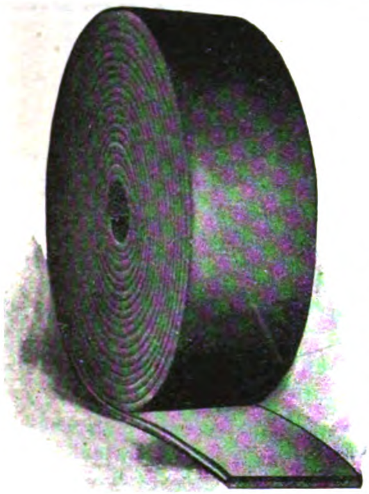

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The Republic Belting & Supply Co.

Formerly the Bodifield Belting Co.

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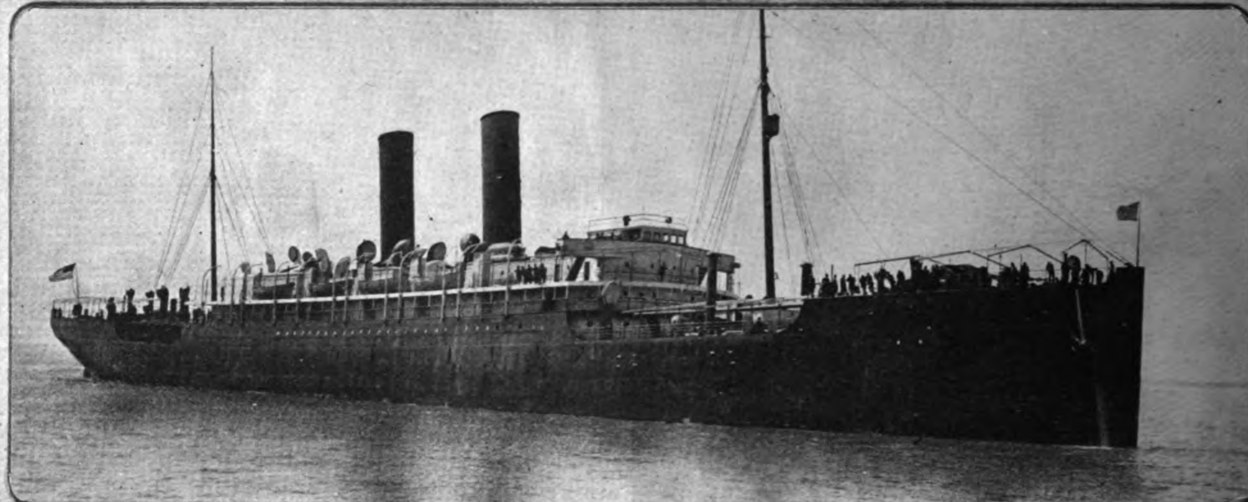

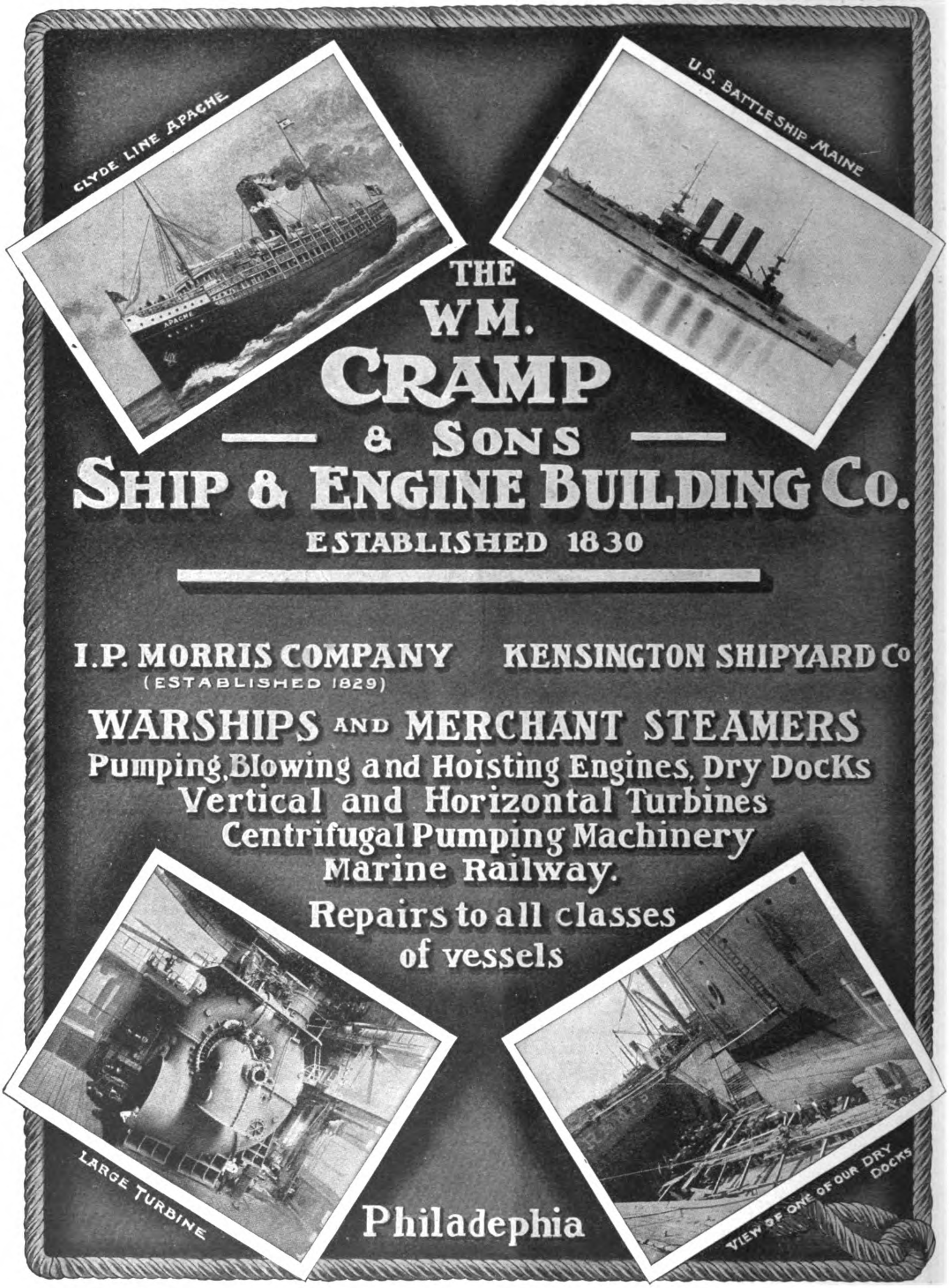
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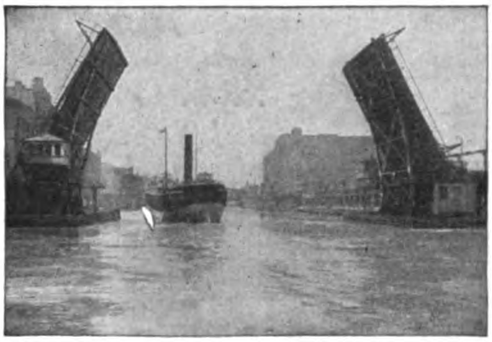
Centrifugal Pumping Machinery
Marine Railway.
Repairs to all classes
of vessels
LARGE TURBINE
VIEW OF ONE OF OUR DRY DOCKS
Philadephia



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have already been built, superseding and replacing swing bridges and other old types of movable bridges for railroads, electric railways and highways in the most progressive cities and harbors of the world.

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World's Fair, St. Louis, 1904

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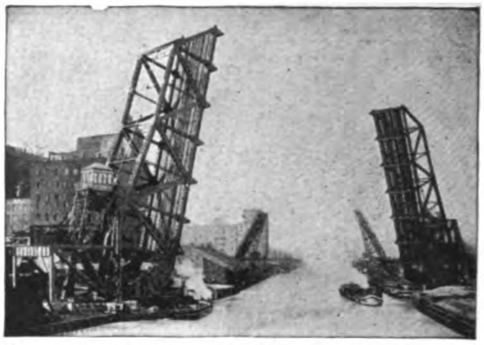

Modern Railroad Scherzer Rolling Lift Bridge in the open position. Longest span Bascule Bridge in the world. Also Highway Scherzer Rolling Lift Bridge open further down the river.

Established 1869 Incorporated 1896

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Successors to Berry & Orton Company

Manufacturers of

Machinery for Working Wood

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For use in Ship Yards, Car Shops, Railroad Shops.

Estimates furnished. Send for Catalogue.

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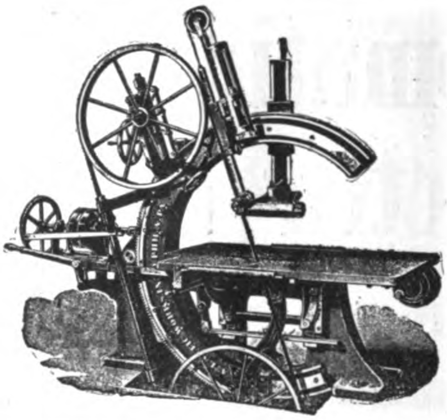

Adjustable Bevel Band Saw

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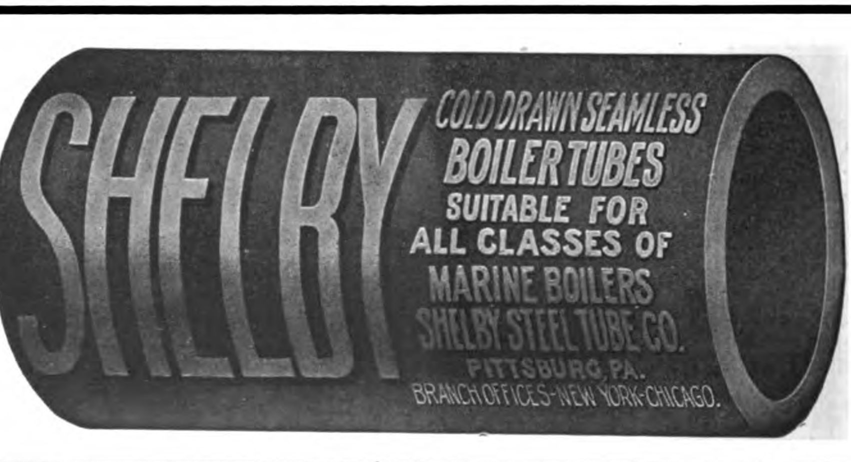
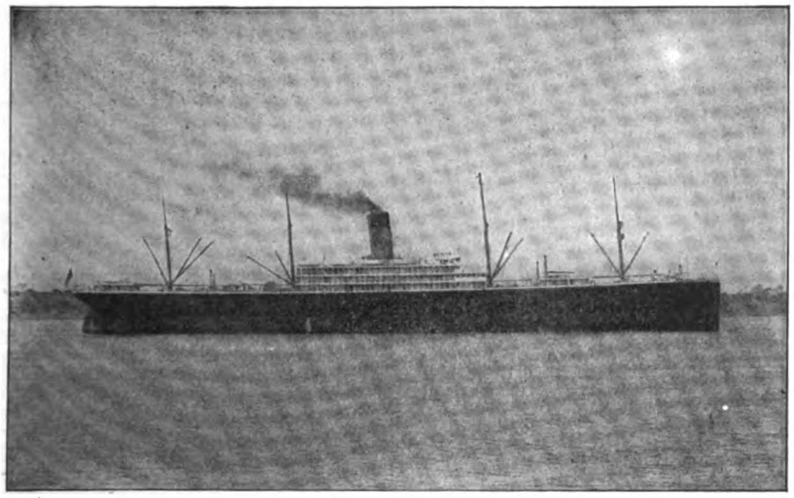
Power movement to change angles

Power feed in three directions



Hyde Windlasses and Capstans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Repairs and	General
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U. S. Engineer Office, Jones Building, Detroit, Mich., Aug. 22, 1906. Sealed proposals for removing earth and boulders from Section 3, channel along Bois Blanc Range, Detroit river, will be received at this office until 2 p. m., Sept. 11, 1906, and then publicly opened. Information furnished on application. Chas. E. L. B. Davis, Col., Engrs.

SEALED PROPOSALS will be received at the office of the Light-house Board, Washington, D. C., until 2 o'clock P. M., September 29, 1906, and then opened for furnishing the materials and labor of all kinds necessary for the construction and delivery of five steel, steam light-vessels, Nos. 84, 85, 86, 87, and 88, at The Light-House Depot, Tomkinsville, Staten Island, New York; or four of these light-vessels, Nos. 84, 85, 86 and 87, at The Light-House Depot, New York, and No. 88 at The Light-House Depot, Astoria, Oregon, in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to The Light-House Board, Washington, D. C.

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Length 160 ft.; beam 30 ft.; carrying capacity, lumber 525,000 ft., coal 800 tons. Rating in Inland Lloyds Register, A1½*, valuation $22,000. For price and particulars address Capt. P. Larsen, Box 249, Chicago, Ill.

For Sale, Tug Gladiator.

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123 ft long, 24½ ft. beam, hull, 4-inch oak; speed, 11 to 12 miles; 200 tons freight, 8 state-rooms for passengers, dining accommodation and equipment for forty passengers, ferry license for 450 people; engine fore and aft compound 18 and 32 by 18, new Scotch boiler 11¼ x 13, electric lighted. Can now be seen running on ferry route between Owen Sound and King's Royal Park. Possession given after September 1st, price $7,000.00. For further particulars apply to J. K. McLaughlan, Owen Sound Park Co.,

FOR SALE.

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Tug Boat for sale—62 gross tons, A1 condition; also light draught steamer, 380 tons, 165 ft. A. P. LANE, 520 Commercial, Boston, Mass.

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1,000 h. p. fore and aft Neafie & Levy compound Engine; surface condenser; independent pumps.
Two 12-foot Scotch Boilers.
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One Providence Windlass, 50 fathoms 1½ in. chain.
Two thrust Shafts and Bearings, 8½ in. diameter.

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PASSENGER STEAMER.

WANTED.—A small passenger steamer in exchange for tug 77 ft. over all, beam, 18 ft.; draught, 7 ft.; engine, 16 in. by 16 in.; boiler, steam allowed, 110; hull rebuilt 1904. Address C. H. M., MARINE REVIEW, Cleveland, O.

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INFORMATION WANTED regarding good farm for sale, with good title, somewhere near Cleveland. Give price, description and character of soil. Also state when possession can be had. Owners only, need answer. State how far from town. Address W. C. Cunningham, Andrus Bldg., Minneapolis, Minn.

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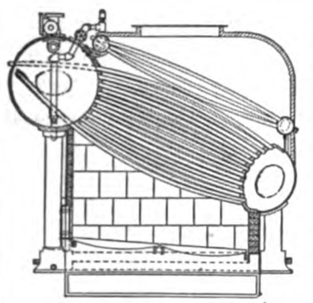

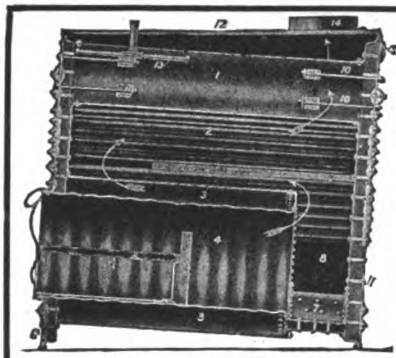

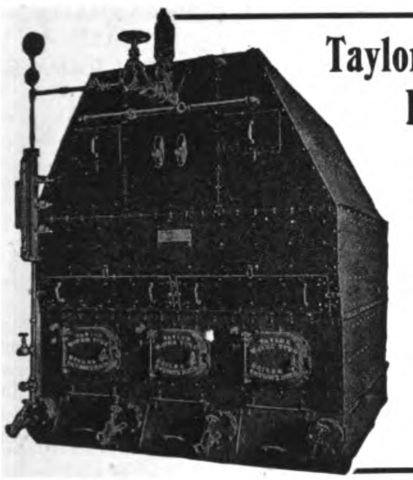

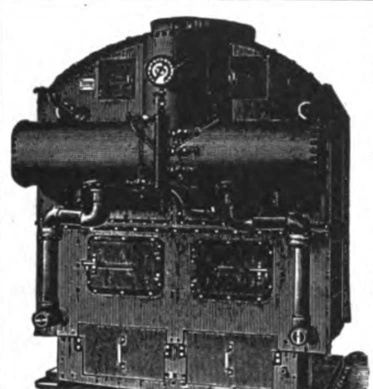

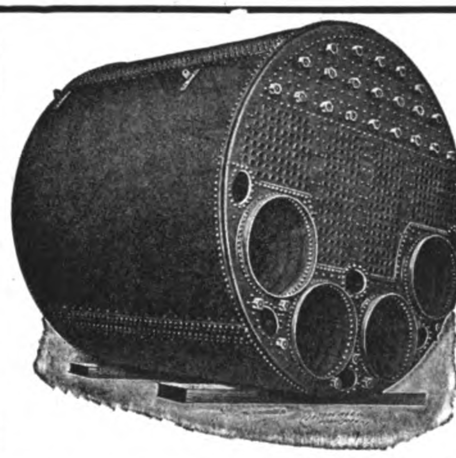

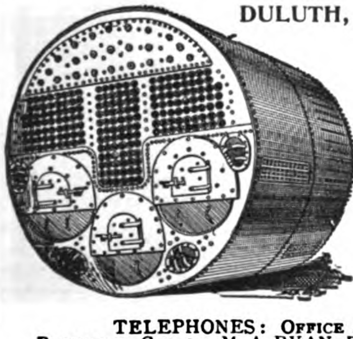

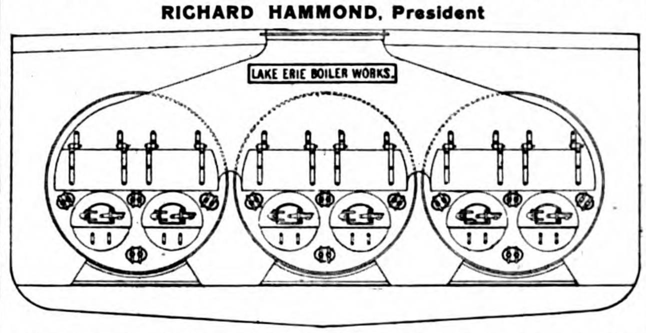
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Lockwood Mfg. Co................. ....East Boston, Mass.
Maryland Steel Co................. ....Sparrows Point, Md.
Milwaukee Dry Dock Co., Milwaukee.
Mosher, Chas. D.........New York.
Newport News Ship Building Co.... ....Newport News, Va.
New York Ship Building Co........ ....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co. .... Duluth, Mich.
Quintard Iron Works Co., New York.
Roach's Ship Yard......Chester, Pa.
Sheriffs Mfg. Co.........Milwaukee.
Superior Ship Building Co......... .... Superior, Wis.
Thropp, J. E. & Sons Co........... ....Trenton, N. J.
Toledo Ship Building Co......Toledo.
Trout, H. G................Buffalo.

ENGINE ROOM TELEGRAPH CALL BELLS, ETC.
Cory, Chas. & Son......New York.
Marine Mfg. Supply Co., New York.

ENGINEERING SPECIALTIES AND SUPPLIES.
Lunkenheimer Co. ...... Cincinnati.
Northwestern Steam Boiler & Mfg. Co. .... Duluth, Minn.

ENGINEERS, MARINE, MECHANICAL, CONSULTING.
Hynd, Alexander .... Cleveland.
Hunt, Robt. W. & Co......Chicago.
Kidd, Joseph..........Duluth, Minn.
Mosher, Chas. D........New York.
Nacey, James .... Cleveland.
Roelker, H. B...........New York.
Wood, W. J................Chicago.

FANS.
American Blower Co., Detroit, Mich.

FEED WATER PURIFIERS AND HEATERS.
Ross Valve Co..........Troy, N. Y.
Wheeler Condenser & Engineering Co. .... New York.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.
General Electric Co................. ....Schenectady, N. Y.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.
Cleveland City Forge & Iron Co.... .... Cleveland.
Fore River Shipbuilding Co......... .... Quincy, Mass.

FLUE WELDING.
Fix's S. Sons............Cleveland.

FUELING COMPANIES AND COAL DEALERS.
Hanna, M. A. & Co......Cleveland.
Parker Bros. Co., Ltd......Detroit.
Pickands, Mather & Co., Cleveland.
Pittsburg Coal Co........Cleveland.
Smith, Stanley B., & Co.. Detroit.
Toledo Fuel Company, ...Toledo, O.

FURNACES FOR BOILERS.
Continental Iron Works, New York

GAS BUOYS.
Safety Car Heating & Lighting Co.. .... New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co........Cleveland.

GAUGES, STEAM AND VACUUM.
Lunkenheimer Co. ...... Cincinnati.

GAUGES, WATER.
Lunkenheimer Co......Cincinnati, O.

GENERATING SETS.
General Electric Co................ ....Schenectady, N. Y.

GRAPHITE.
Dixon Crucible Co., Joseph.......... ....Jersey City, N. J.

HAMMERS, STEAM.
Chase Machine Co........Cleveland.

HEATING AND VENTILATING APPARATUS.
American Blower Co., Detroit, Mich.

HOISTS FOR CARGO, ETC.
American Ship Building Co.......... .... Cleveland.
Brown Hoisting Machinery Co...... .... Cleveland.
Chase Machine Co.......Cleveland.
Dake Engine Co.................... ....Grand Haven, Mich.
General Electric Co......New York.
Hyde Windlass Co........Bath, Me.
Marine Iron Co............Bay City.

HOLLOW STAYBOLT IRON.
Falls Hollow Staybolt Co.......... ....Cuyahoga Falls, O.

HYDRAULIC DREDGES.
Great Lakes Engineering Works.... .... Detroit.

HYDRAULIC TOOLS.
Watson-Stillman Co., The......... .... New York.

ICE MACHINERY.
Great Lakes Engineering Works.... .... Detroit.
Roelker, H. B............New York.

INJECTORS.
American Injector Co......Detroit.
Jenkins Bros.............New York.
Lunkenheimer Co. ...... Cincinnati.
Penberthy Injector Co............. .... Detroit, Mich.

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Elphicke, C. W. & Co......Chicago.
Gilchrist & Co., C. P.....Cleveland.
Hawgood & Co., W. A., Cleveland.
Helm & Co., D. T..........Duluth.
Hutchinson & Co.........Cleveland.
McCarthy, T. R...........Montreal.
McCurdy, Geo. L...........Chicago.
Mitchell & Co............Cleveland.
Parker Bros. Co., Ltd......Detroit.
Peck, Chas. E. & W. F............ ....New York and Chicago.
Prindiville & Co............Chicago.
Richardson, W. C........Cleveland.
Sullivan, D. & Co..........Chicago.

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IRON ORE AND PIG IRON.
Bourne-Fuller Co......Cleveland, O.
Hanna, M. A. & Co........Cleveland.
Pickands, Mather & Co., Cleveland.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.
Truscott Boat Mfg. Co..................St. Joseph, Mich.

LIFE PRESERVERS, LIFE BOATS, BUOYS.
Armstrong Cork Co......Pittsburg.
Carley Life Float Co..................New York, N. Y.
Drein, Thos. & Son................ Wilmington, Del.
Kahnweiler's Sons, D.....New York.

LIGHTS, SIDE AND SIGNAL.
Russell & Watson...........Buffalo.

LOGS.
Nicholson Ship Log Co., Cleveland.
Walker & Sons, Thomas................ Birmingham, Eng.

LUBRICATING GRAPHITE.
Dixon Crucible Co., Joseph................Jersey City, N. J.

LUBRICATORS.
Lunkenheimer Co. ...... Cincinnati.

LUMBER.
Martin-Barriss Co. ...... Cleveland.

MACHINISTS.
Chase Machine Co........Cleveland.
Hickler Bros., Sault Ste. Marie, Mich.
Lockwood Mfg. Co...............East Boston, Mass.

MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc....Philadelphia.

MARINE RAILWAYS.
Hickler Bros., Sault Ste. Marie, Mich.

MARINE RAILWAYS, BUILDERS OF.
Crandall & Son, H. I..............East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.............New York

MECHANICAL DRAFT FOR BOILERS.
American Ship Building Co......................... Cleveland.
Detroit Ship Building Co., Detroit.
Great Lakes Engineering Works.... .... Detroit.

METALLIC PACKING.
Katzenstein, L. & Co., New York.
The National Metallic Packing Co.. ....Oberlin, O.

MOTORS, GENERATORS—ELECTRIC.
General Electric Co................Schenectady, N. Y.

NAUTICAL INSTRUMENTS.
Ritchie, E. S., & Sons................. Brookline, Mass.

NAVAL ARCHITECTS.
Hynd, Alexander ....Cleveland
Kidd, Joseph ....Duluth, Minn.
Mosher, Chas. D.........New York.
Nacey, James ....Cleveland
Wood, W. J................Chicago

OAKUM.
Stratford, Oakum Co.................Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph................Jersey City, N. J.

PACKING.
Jenkins Bros............New York.
Katzenstein, L. & Co...New York.
Robertson, Jos. L. & Sons................New York.
The National Metallic Packing Co... .... Oberlin, O.
Republic Belting & Supply Co....................Cleveland, O.

PAINTS.
Baker, Howard H. & Co....Buffalo.
Upson-Walton Co........Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc. ..Philadelphia.

PILE DRIVING AND SUBMARINE WORK.
Buffalo Dredging Co........Buffalo.
Dunbar & Sullivan Dredging Co.... .... Buffalo.
Great Lakes Dredge & Dock Co.... .... Chicago.
Hickler Bros..Sault Ste. Marie, Mich.
Hubbell Co., H. W...Saginaw, Mich.
Parker Bros. Co., Ltd.......Detroit.
Smith Co., L. P. & J. A...Cleveland.
Starke Dredge & Dock Co., C. H... ....Milwaukee.
Sullivan, M.................Detroit.

PIPE, WROUGHT IRON.
Bourne-Fuller Co......Cleveland, O.

PLANING MILL MACHINERY.
Atlantic Works, Inc....Philadelphia.

PLATES—SHIP, STRUCTURAL, ETC.
Bourne-Fuller Co......Cleveland, O.
Otis Steel Co...........Cleveland.

PRESSURE REGULATORS.
Ross Valve Co..........Troy, N. Y.

PROPELLER WHEELS.
American Ship Building Co......................... Cleveland.
Atlantic Works ..East Boston, Mass.
Cramp, Wm. & Sons..Philadelphia.
Detroit Ship Building Co....Detroit.
Fore River Shipbuilding Co......... .... Quincy, Mass.
Great Lakes Engineering Works.... .... Detroit.
Hyde Windlass Co........Bath, Me.
Lockwood Mfg. Co...............East Boston, Mass.
Milwaukee Dry Dock Co.......... ....Milwaukee.
Newport News Ship Building Co.. ....Newport News, Va.
Roelker, H. B..........New York.
Sheriffs Mfg. Co........Milwaukee.
Superior Ship Building Co......... ....Superior, Wis.
Thropp & Sons Co., J. E.......... ....Trenton, N. J.
Toledo Ship Building Co......Toledo.
Trout, H. G................Buffalo.

PROJECTORS, ELECTRIC.
General Electric Co..............Schenectady, N. Y.

PUMPS FOR VARIOUS PURPOSES.
Great Lakes Engineering Works.. .... Detroit.
Kingsford Foundry & Machine Works ....Oswego, N. Y.
Wheeler Condenser & Engineering Co. ....New York.

REFRIGERATING APPARATUS.
Great Lakes Engineering Works.... .... Detroit.
Roelker, H. B..........New York.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register......Cleveland.

RIVETS, STEEL FOR SHIPS AND BOILERS.
Bourne-Fuller Co.......Cleveland, O.

RUBBER SUPPLIES.
Republic Belting & Supply Co...... .... Cleveland, O.

SAFETY VALVES.
Lunkenheimer Co.........Cincinnati.

SAIL MAKERS.
Baker, Howard H. & Co....Buffalo.
Upson-Walton Co........Cleveland.

SALVAGE COMPANIES.
See Wrecking Companies.

SEARCH LIGHTS.
General Electric Co...............Schenectady, N. Y.

SHEARS.
See Punches, and Shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co......Cleveland, O.
Otis Steel Co...........Cleveland.

SHIP BUILDERS.
American Ship Building Co......... .... Cleveland.
Atlantic Works ..East Boston, Mass.
Buffalo Dry Dock Co.......Buffalo.
Cramp, Wm. & Sons..Philadelphia.
Chicago Ship Building Co..Chicago.
Detroit Ship Building Co....Detroit.
Fore River Ship Building Co....... ....Quincy, Mass.
Great Lakes Engineering Works.... ....Detroit.
Lockwood Mfg. Co...............East Boston, Mass.
Manitowoc Dry Dock Co.................Manitowoc, Wis.
Maryland Steel Co..............Sparrow's Point, Md.
Milwaukee Dry Dock Co.......... .... Milwaukee.
Newport News Ship Building Co... ....Newport News, Va.
New York Shipbuilding Co........ ....Camden, N. J.
Roach's Ship Yard.....Chester, Pa.
Shipowner's Dry Dock Co..Chicago.
Toledo Ship Building Co......Toledo.

SHIP CHANDLERS.
Baker, Howard H. & Co....Buffalo.
Marine Mfg. & Supply Co....... .... New York
Upson-Walton Co........Cleveland.

SHIP DESIGNERS.
Kidd, Joseph ....Duluth.
Steel, Nacey, & Hynd....Cleveland
Wood, W. J................Chicago

Buyers' Directory of the Marine Trade---*Continuea.*

SHIP LANTERNS AND LAMPS.
Upson-Walton Co.......... Cleveland.

SHIP TIMBER.
Martin-Barriss Co.........Cleveland.

SIGNALS—SUBMARINE.
Submarine Signal Co............Boston

SMOOTH-ON COMPOUND, FOR REPAIRS.
Smooth-On Mfg. Co.................Jersey City, N. J.

STAYBOLT IRON OR STEEL BARS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.........................Cuyahoga Falls, O.

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Holmes, Samuel ....New York.
McCarthy, T. R.....Montreal, Can.

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American Line ....New York.
Anchor Line ....Buffalo.
Boston Steamship ....Boston.
C. & B. Transit Co...........Cleveland.
International Mercantile Marine Co. .... Philadelphia.
Mallory Line ....New York.
New York & Cuba Mail S. S. Co.. ....New York.
Red Star Line ....New York.

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Robertson, Jas. L. & Sons ..New York.

STEEL CASTINGS.
Otis Steel Co............Cleveland.

STEERING APPARATUS.
American Ship Building Co........ ....Cleveland.
Chase Machine Co.......Cleveland.
Dake Engine Co.................................Grand Haven, Mich.
Detroit Ship Building Co....Detroit.
Hyde Windlass Co........Bath, Me.
Marine Mfg. & Supply Co.......... ....New York.
Sheriffs Mfg. Co........Wilwaukee.

SUBMARINE DIVING APPARATUS.
Morse & Son, A. J..........Boston.
Schrader's Son, Inc. A....New York.

SURVEYORS, MARINE.
Hynd, Alexander ....Cleveland.
Parker Bros. Co., Ltd......Detroit.
Nacey, James ....Cleveland.
Steel, Adam ....Cleveland.
Wood, W. J..............Chicago.

TESTS OF MATERIALS.
Hunt, Robert W. & Co....Chicago.
Lunkenheimer Co....Cincinnati, O.

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Goldschmidt Thermit Co., ... New York City.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Watson-Stillman Co......New York.

TOOLS, WOOD WORKING.
Atlantic Works, Inc....Philadelphia.

TOWING MACHINES.
American Ship Windlass Co..........................Providence, R. I.
Chase Machine Co.......Cleveland.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co.. ....Kingston, Ont.
Great Lakes Towing Co..Cleveland.

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Boston & Lockport Block Co...... .... Boston.

TUBING, SEAMLESS.
Shelby Steel Tube Co..Pittsburg, Pa.

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Jenkins Bros. ....New York
Lunkenheimer Co........Cincinnati.
Ross Valve Co.........Troy, N. Y.

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Ashton Valve Co.,..........Boston.
Lunkenheimer Co........Cincinnati.
Republic Belting & Supply Co...... ....Cleveland, O.
Ross Valve Co........Troy, N. Y.

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Boland, John J.............Buffalo.
Douglas, G. L. Jr............Duluth
Elphicke, C. W. & Co......Chicago.
Hall, John B................Buffalo.
Helm & Co., D. T..........Duluth.
Hawgood & Co., W. A....Cleveland.
Holmes, Samuel ....New York.
Hutchinson & Co.........Cleveland.
McCarthy, T. R...........Montreal.

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Mitchell & Co............Cleveland.
Parker Bros. Co., Ltd......Detroit.
Prindiville & Co............Chicago.
Richardson, W. C.........Cleveland.
Sullivan, D. & Co..........Chicago

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Lunkenheimer Co.....Cincinnati, O.

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Lunkenheimer Co........Cincinnati.

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Upson-Walton Co.........Cleveland.

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American Ship Windlass Co........ .... Providence, R. I.
American Ship Building Co........ .... .Cleveland.
Dake Engine Co.................................Grand Haven, Mich.
Hyde Windlass Co........Bath, Me.
Marine Mfg. & Supply Co........ ....New York.

WINCHES.
American Ship Windlass Co.........................Providence, R. I.
Hyde Windlass Co........Bath, Me.

WOOD WORKING MACHINERY.
Atlantic Works, Inc....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Donnelly Salvage & Wrecking Co.. .... Kingston, Ont.
Great Lakes Towing Co..Cleveland.
Parker Bros. Co., Ltd.......Detroit.

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Drein, Thos. & Son................................ Wilmington, Del.
Manitowoc Dry Dock Co.......... .... Manitowoc, Wis.
Truscott Boat Mfg. Co..............................St. Joseph, Mich.

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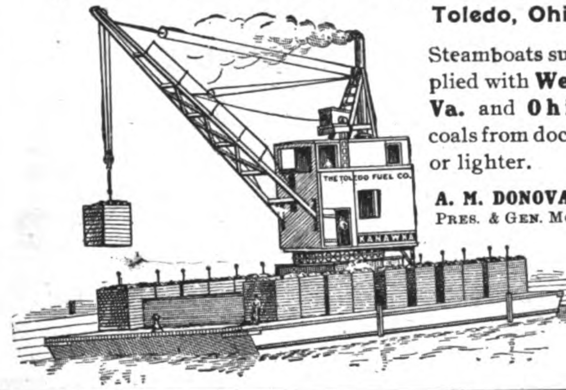

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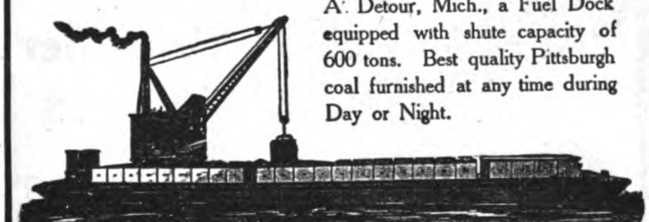

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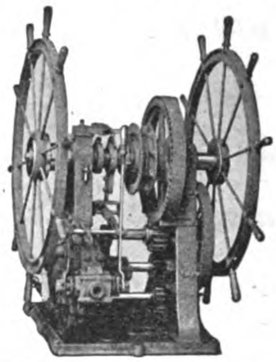

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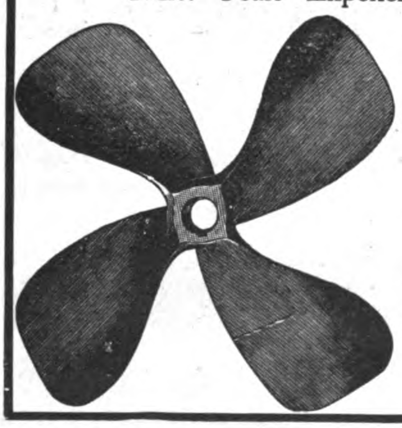

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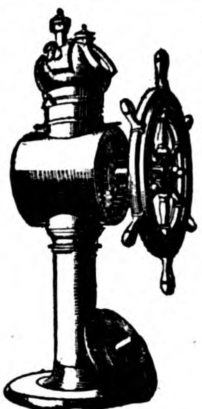

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Suite 1505-1506-1507 Fort Dearborn Bldg.
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